



CERTAIN powerful branches of the chemical industry are more closely related to the Plastic field than they are aware. Running over the long list—solvents, dyes and pigments, phenol, furfural, cellulose acetate, cresylic and other acids, plasticizers, phthalic anhydride and countless others—one is struck by the rapidity of new incorporations and changes in financial structure. In a recent issue of a contemporary chemical monthly, ten mergers, five re-finances, five new plant constructions and three new incorporations were reported among chemical leaders whose distribution to the plastic industry is considerable! One is again struck by the fact that plastic materials are founded on a chemical basis.

But it is even stronger than that. Without these chemicals so consumed there would be no plastics. And no PLASTICS either! The molder, jobber, importer and fabricator would be unknown. More than ever before has come the understanding that market value of raw commodities influence purchasing and selling among the branches of the industry.

For this reason alone, we have tried to give pertinent news about certain chemical industries and have solicited the support of numerous interested companies. There are other reasons which alone compensate for any seeming editorial digression. We are glad to note, however, that such a policy is well received and is being earnestly supported. We have said before in this column that "very busy people always find time for everything", and from a recent questionnaire we are shown that our very busy subscribers find time to read and comment intelligently even on the diverse chemical industry.

With such an audience and such a market no chance of education must be lost. We are doing that—very impartially—and we are gratified to find that some of our fond ideals are being realized. The Publishers.

PLASTICS

& MOLDED PRODUCTS

A periodical devoted to the manufacture and use of plastic and composition products

Vol. 5

SEPTEMBER, 1929

No. 9

Contents

Plasticizers, Plastics and Plasticity, By Paul Bary	497
Pyroxylin as an Imitative Material, By Joseph Rossman	500
Synthetic Resins and Cellulose Esters Combined	506
World's Recent Progress in Synthetic Resins, By Dr. Aladin	507
Extruded Artificial Pearl Products Have Pleasing Appearance	510
Vulcanization + Hydraulic Cement = Plastic	511
Technical Abstract Section	512

MOLDED PRODUCTS—See Page 523

What Profits Price Cutting? By R. C. Gilmore, Jr.	523
Pep in Package and Product	524
Q. R. S. Kamra Has Beautiful Molded Case	525
Synthetic Resins in Industry, By Chas. H. Prange, M. E.	526
Amerith Inc. has Modern Toiletware Showroom	528
The Design of Molded Products, By W. F. Lent	529
News of the Industry	532

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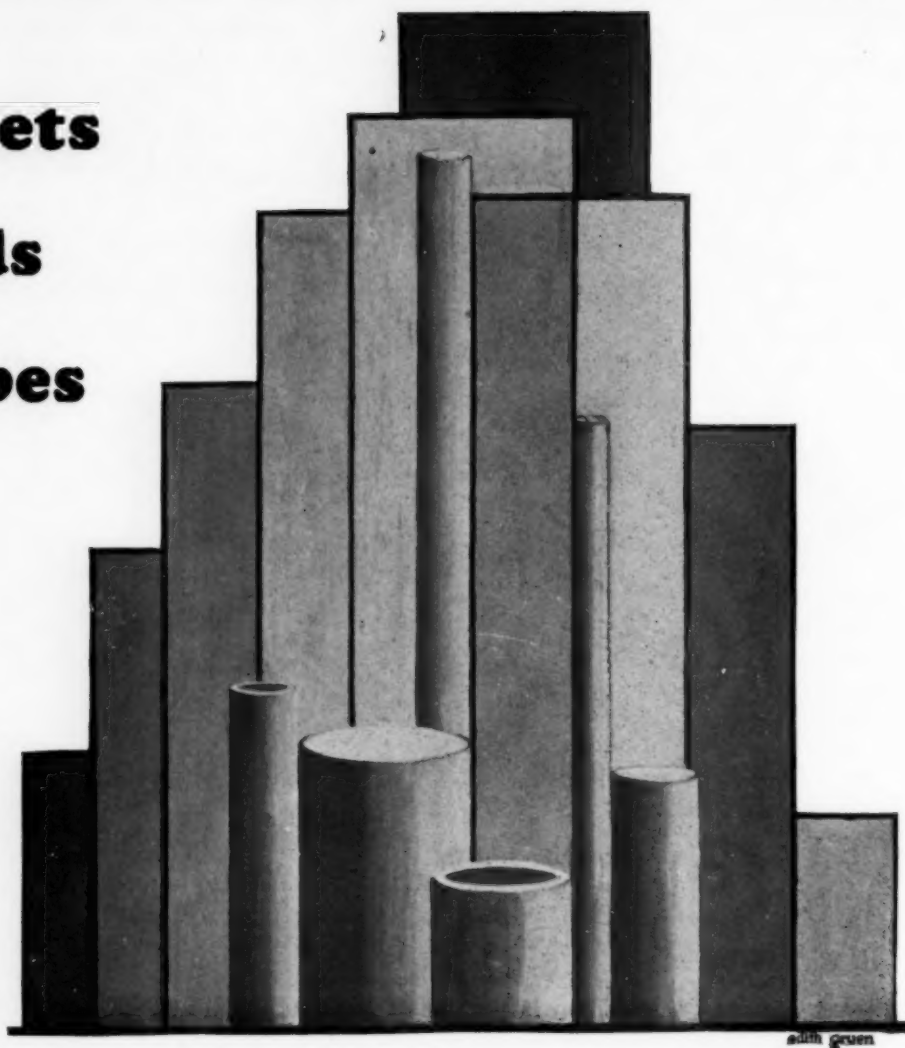
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Plasticizers, Plastics and Plasticity

Some theoretical considerations that aid in
the understanding of the problems confront-
ing those working with the plastic materials

By Paul Bary

Consulting Engineer, Paris, France

IN describing the properties of a plastic material, we are somewhat handicapped by the fact that the term "plasticity" is somewhat indefinite and is, by many, confused with the terms viscosity. There is however a considerable difference between these two terms.

The term "plastic materials" is usually applied to substances which at certain temperatures and under definite pressures yield and take a certain shape, which shape they retain when the force applied to them is relieved and the temperature lowered. They thus differ from elastic bodies which while taking the shape of the body impressed on them, or which deform under the influence of mechanical force, return to their original condition when the force is removed.

Elasticity and Plasticity

It is also true that many plastic materials, when finally manufactured into the finished products possess, in addition to their properties of plasticity, considerable elasticity as well. The two properties are however somewhat opposed to each other and it is usually the case that a material is elastic at one temperature and plastic at another.

The functions of viscosity and elasticity, the constitution of the materials making up the base of the plastic materials must all be taken into consideration when deciding what particular material may best serve a given purpose.

*This article is condensed and translated from the original French from the journal *Caoutchouc et Gutta-Percha*, Paris; 1929, March pp 14464—14468.*

In addition to the qualities of elasticity and plasticity, there must be added the quality of viscosity, which plays by no means an unimportant role in the definition of the properties of a plastic material, as the viscosity is the determining factor in deciding the temperature and pressure necessary to bring about a definite and permanent change in the contour of the object made from the material.

The particular properties that render a substance plastic, in the term herein used, depend a great deal on the colloidal nature of the material used to produce it. It is impossible to discuss intelligently the conditions neces-

sary to bring about the plasticity of a given material without recourse to a general knowledge of the colloidal properties of the materials, and especially the behavior of the same when it is in a state of dispersion or has been acted upon by solvents or swelling agents.

In what is hereinafter to follow, we propose to explain, as far as possible, the mechanism of plastification on the theory of colloid chemistry.

II. Polymerization and Solvent Action.

The colloidal materials, which form the indispensable constituent of plastics, are usually substances characterized by strong polymerization, which however is variable, and, either according to the temperature or the chemical nature of the environment in which the material is placed. The polymerization is not always of the same kind. The various types that lead to plastic products will be taken up one at a time.

An indispensable property to render a given compound (say, for example R) colloidal is its state of being unsaturated, that is to say one or two of the chemical valencies in the compound must remain available for engagement with another sub-

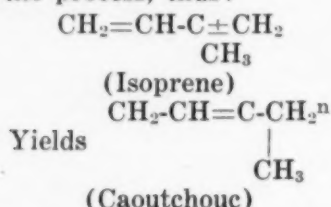
stance or with itself. It is not merely sufficient that this should be the case, but it is the one indispensable fact before polymerization can take place. The product resulting, for example, from the polymerization of a substance may be expressed:



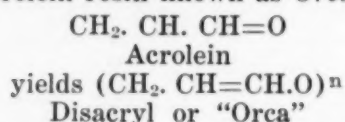
in which case the body is divalent, the same as the original substance R'' . In such a polymerized compound the same may exist as a chain of the molecules R , as:



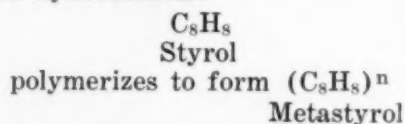
One example of this kind of colloid is caoutchouc $(C_5H_8)_n''$ which is divalent, for the molecule of isoprene from which the caoutchouc is derived has two unsaturated bonds or valencies. One of these double bonds is replaced by the next molecule and the other of them is destroyed in the process, thus:



A similar case of polymerization to form a resin is that involved in the preparation of an acrolein resin known as *Orca*:



Another example of this kind is cinnamene, otherwise known as styrol, which is an unsaturated hydrocarbon:



In the various examples above given, the degree of polymerization, which is another way of stating the size of the number " n ", depends much upon the nature of the foreign material present during the polymerization. If the polymerized substance retains some of the unsaturated bonds, and this number is equal to the number n , then to bring the polymerization to completion it becomes necessary that the terminal affinities or free bonds be saturat-

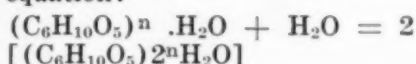
ed with monovalent molecules or radicals.

Cellulose is an excellent example of this type of colloid. The empirical formula of the mother substance of cellulose is $C_6H_{10}O_5$, but in its polymerized form it becomes $-(C_6H_{10}O_5)_n-$; but the ordinary form of cellulose is that of its hydrated form, namely hydrocellulose or $HO-(C_6H_{10}O_5)-H$ which thus carries a small amount of water as a part of its molecule.

Whenever the amount of water thus combined because relatively great and the molecule relatively small the coefficient approaches the value of 1, and there is finally obtained a comparatively simple substance that has not longer any colloidal properties, namely dextrose (glucose). This may be considered as a simple molecule of cellulose in the non-polymerized form plus a molecule of water, thus:

$$C_6H_{10}O_5 \cdot H_2O = C_6H_{12}O_6$$

The gradual depolymerization or hydrolysis of cellulose may thus be represented by the gradually entry of water molecules into the cellulose molecule. This may be represented in an equation:



The water in this case has brought about a gradual depolymerization of the cellulose with resultant *solvation* of the molecule until a sufficiently small molecule is obtained which has the property of either completely dissolving in water or of being dispersed therein as extremely minute particles which remain in suspension.

III. Polymerization by Condensation

While the polymerization as the result of the combination of molecules of the same kind with each other, there is another kind of polymerization which results from the union of different kinds of molecules. This form is somewhat more complicated but is the basis of many of the processes that lead to the manufacture of artificial resins. It is also the basis of the insolubilization of gelatin, casein and simi-

lar albumenoid substances by formaldehyde, and is a factor in the hardening or vulcanization of oils by sulfur and sulfur halogenides.

Formation of Resins

These various kinds of diverse polymerization or condensation take place between one substance and an intermediary substance, (such for example as an aldehyde, sulfur, oxygen or the like), the intermediary molecule acting as the means for assembling a large number of the other molecules into a complex body. Take for example the formation of synthetic resins by the condensation of phenol and aldehydes. While this reaction has perhaps been studied in more detail and more often than any other it remains a fact that there are hardly two workers who will agree on what actually takes place, nor has the correct constitution of the resulting resin been ascertained with any degree of certainty.

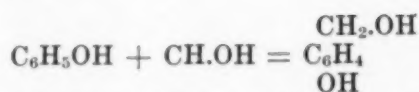
According to some recent work on this subject, carried out by Sato and Sekine, it appears probable that during the early stages of the condensation a substance having an oily consistency forms. This has actually been isolated by fractionally dissolving the results of the condensation.

According to a view held by Aylsworth, the combination of 3 molecules of phenol and 2 molecules of formaldehyde gives rise to a substance having the general formula of $HO.C_6H_4-CH_2-C_6H_4.O-CH_2-C_6H_4.OH$.

This formula is supported by the proportions of the materials used, but it is nevertheless true that proportions can be very widely varied and thus give rise to a large number of different resins, which, however, have analogous properties. One thing is certain, and that is that the reaction between the phenol and the aldehyde gives rise to the formation of water.

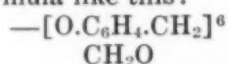
Rashig's Theory

Rashig has proposed a somewhat simplified formula on the basis of which the reaction is supposed to proceed as follows:



However, such a substance as that obtained above is capable of further polymerization about in the same manner as that of hydrocellulose, except in the reverse direction, and will therefore discard water and will build up to a product having a new molecular rearrangement: $2[\text{H}.\text{OC}_6\text{H}_4\text{CH}_2\text{OH}] = \text{H}.\text{OC}_6\text{H}_4\text{CH}_2\text{O}.\text{C}_6\text{H}_4\text{CH}_2\text{OH} + \text{H}_2\text{O}$ Further reaction and polymerization then follow with the final production of a substance that might be represented as:

$\text{H}[\text{O}.\text{C}_6\text{H}_4\text{CH}_2]_n\text{OH} = [\text{O}.\text{C}_6\text{H}_4\text{CH}_2]_n + \text{H}_2\text{O}$ and which contains again two bonds occupied by a molecule of water which is relatively easily displaced. It is believed that Bakelite is of this nature. It will be noticed that this explanation differs but a slightly from that offered by Baekeland who writes the formula like this:



This ascribes to the material a closed-chain structure having two bonds free for solvation to take place, and that this is characteristic of the structure of most of the substances formed by polymerization. Baekeland believes that the lowest number ascribable to the factor n is about 6, but at present it is still impossible to determine accurately the correct molecular weight of these substances.

The further advantage of the closed chain-formula is that it serves as a fair explanation of the behavior of various condensing agents and catalysts and accounts for the remarkable variation in the properties of the materials in accordance with the manner in which the condensation is carried out.

The condensation of the proteins (such as gelatin, casein etc.) with formaldehyde, might be explained along similar lines. An examination of the oxidation reactions and the action of sulfur and sulfur compounds on oils (formation of factis) also leads to the conclusion that the act of polymerization involves a combination of one molecule

with the other in the presence of a material acting as a solvating agent, which is progressively again eliminated as the polymerization progresses. The stability of the final products appears to depend on the degree of the polymerization itself.

IV. Gels

The simpler colloidal materials are usually found in a comparatively high state of polymerization and are a most always in amorphous form. They are comparatively rigid substances and are of high tensile strength and possessed of considerable elasticity (such as for examples certain natural silicates, high-quality natural resins and gums, gelatine etc.). They are in their natural state almost entirely devoid of plasticity as such and many be powdered. Some of them as ordinary rosin, are quite friable and readily powdered. On the other hand some of the colloidal plastics are very tough and can hardly be powdered at all; for example the cellulose esters such as the nitrate and acetate, casein solids etc. which have had the benefit of the action of a solvent during their manufacture and which hence have developed the qualities of transparency and elasticity and toughness.

Most of these substances in the presence of fluids and solids that are SOLVENTS of the same, will swell and lose their rigidity, developing as the result of such action a great degree of elasticity. This differentiates them from some of the other types of plastic materials. The action of relatively small amounts of solvents will convert such a colloidal material into what is termed a "gel". The common water-swollen gelatin of commerce is perhaps the example best known to laymen.

Gels, then, are solution of the solvent in the material itself. In other words the terms are reversed and the solvent is dissolved in the solute. Such solutions however have many of the properties of ordinary solutions. If one might digress a little, it may be mentioned that in an ordinary solution, so called, the material dissolved is uniformly

distributed through the solvent; in some cases, as for example alcohol and water, the two materials appear to be mutually interspersed with each other.

In the case of gels, however, the phenomenon of solution takes a somewhat different course and may be likened to a gradually transition from the solid to the liquid state. In other words there occurs a process of depolymerization of the colloidal substance in proportion to the amount of solvent added thereto. This may take place by a breaking down of the size of the molecule and an entry of some of the solvent itself. Such a phenomenon might also be explained on the basis of hydrolysis or of "alcoholysis".

Gelatin

In order to get a concrete idea of what takes place, we might consider for example the action of gelatin when placed in water. When this is done below 20°C . the gelatine will take up water until it reaches a definite limit. After a time an equilibrium between the intumescence of the gelatin and the taking up of water is reached. If however a very slight amount of an acid, even as small an amount as 3.5 parts per 10,000 parts of water is used, the amount of swelling of the gelatin may be increased from 5 to 6 times. Alkalines, such as soda, act likewise.

A similar phenomenon is exhibited by cellulose nitrate in the presence of certain solvents. Certain mixtures of ether-alcohol will only cause cellulose nitrate to swell up therein at a certain temperature. If the ether-alcohol mixture however contains even a small amount of water, then a colloidal solution of the cellulose nitrate in the mixture takes place. This has been demonstrated by Lunge and Rehie and by L. E. Smith.

(This article will be continued in the October issue of *Plastics*), taking up the phenomena of plastification, the effects of added pigments and the self-plasticizing colloids).

Pyroxylin as an Imitative Material

How American inventors have solved the problems of imitating nature's most startling ornamental products

By Joseph Rossman

IN the August issue various processes for the production of imitation pearl effects were described.

Another way of utilizing the iridescent and sheen materials is to shape ordinary celluloid into the form of any desired article, then in laying on its surface a sheet which has been rendered iridescent, and finally applying over the base as well as the inlay a covering of material to which the diffused sheen effect has been imparted. It is to be understood, of course, that many other ways will readily suggest themselves combining and utilizing in the industries the bodies or substances which, respectively, have been rendered iridescent and given the diffused sheen effect as above described.

If desired, instead of employing the body containing the diffused sheen effect, in combination with the iridescent body, it may be immersed in a liquid solution capable of depositing a transparent film, to which solution has been added fish scale pigment, thereby securing the desired diffused sheen effect in imitation of mother-of-pearl.

Producing Wavy Effects in Imitation Mother-of-Pearl

According to patent 1,606,030 dated Nov. 9, 1926 a superior and more beautiful and delicate product is attained, and one which more closely resembles the genuine mother-of-pearl, by producing at indiscriminately interspersed points or locations in the product, the wavy lines of lustre or sheen effects which are characteristic of the genuine mother-of-pearl. This char-

There is hardly a natural product, from flowers to corals, and from jade to pearl, that can't be imitated perfectly by the pyroxylin plastics. The modern fountain pen is arrayed in all the colors of the rainbow thanks to these products.

Everything along this line that has ever been patented is described in this comprehensive series of reviews.

acteristic wavy lines of sheen or lustre effect can be produced by relatively varying the character in some one or more respects of the thin sheets which are stacked or piled for compression into the homogeneous cake or block, preparatory to sheeting into the thin sheets for fabricating into commercial articles, and then interspersing such relatively differing sheets indiscriminately in the stack or pile.

According to the present invention it is proposed to introduce at some point in the operation above described a more or less temporary variation in the procedure, and to distribute at various points in the stack or pile the thin sheets produced by the temporary variations, so that when the stack or pile is pressed into a homogeneous block or cake and then sheeted into thin sheets, such sheets will reveal a wavy sheen or lustre effect at indiscriminately positioned locations therein which

imparts a highly pleasing and beautiful appearance more nearly approaching the characteristic sheen and lustre of the genuine mother-of-pearl.

From Thin Sheets

The wavy effect in mother-of-pearl may be secured in various ways. According to one method, the stack or pile of thin sheets to be formed under heat and pressure is built up with some thin sheets produced at one speed of extrusion of the fluid mass through the heated die and other thin sheets indiscriminately interspersed in the stack or pile, but produced at a different rate of speed of extrusion, the temperature at which the extrusion takes place being maintained constant in both instances. This means that in the case of some of the thin sheets the pressure applied to force the fluid mass through the die is increased so as to effect the extrusion at a rate such that there is failure to thoroughly or uniformly iron the surface while others of the sheets in the pile are more thoroughly ironed or calendered.

The same result may be obtained by maintaining a constant pressure and speed of extrusion but varying the temperature of the die to impart the relatively different characteristics to the sheets to be stacked up in the pile.

Still another way of accomplishing the result consists in employing extruded sheets of relatively different thicknesses in building up the stack or pile.

According to another method, the stack or pile is built up of

indiscriminately positioned sheets which are extruded through dies of relatively different lengths, the extruding pressure and temperature remaining the same.

Another method consists in relatively varying the plasticity of the compositions from which the thin sheets are produced, as, for example, by varying the amount of solvent permitted to remain in the mass by subjecting the same to a longer or shorter period of rolling operation.

In order to secure the varied effects referred to there may be employed for indiscriminately located layers in the stack pile, small pieces or sections of one or another of the relatively varying sheets produced by any of the methods referred to.

The resulting product in the form of a thin sheet into which the homogeneously pressed stack or pile is cut or slit, possesses the beautiful, delicate, irregularly dispersed wavy sheen or lustre effects which very closely approaches and simulates the appearance of the best qualities of genuine mother-of-pearl.

Use of Metal Foil

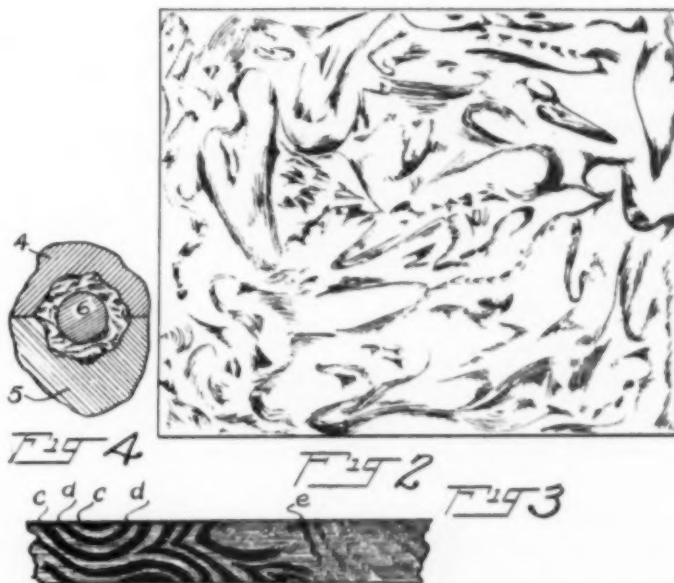
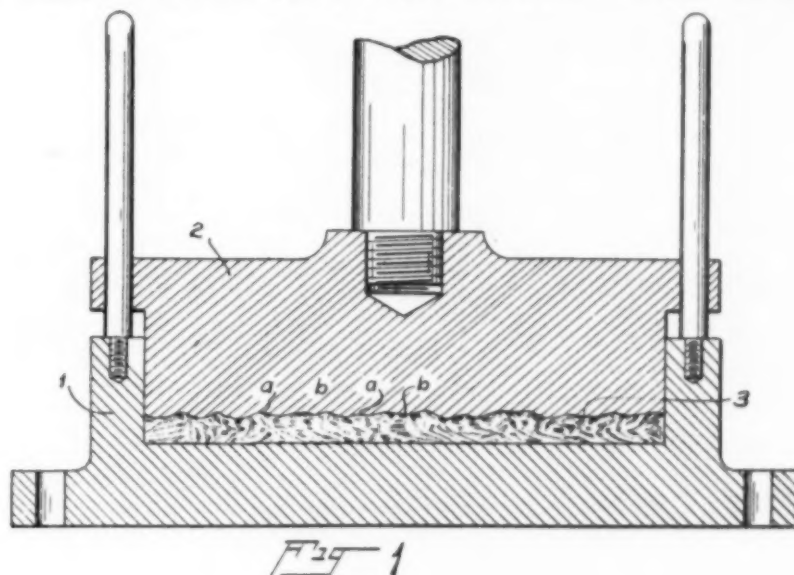
Another recent patent 1,657,172 dated Jan. 24, 1928 describes a method of making a compound celluloid product which comprises the grinding of colors into soft celluloid sheets from the roll, evaporating the solvent from the sheets, compressing the sheets under temperature changes to form a block of celluloid with a pigment therein, sheeting the block, interposing foils between the sheets of the block, subjecting the interposed sheets to pressure under temperature changes to form a homogeneous composite foil and celluloid block, sheeting the composite block across the grain thereof to expose the edges of the foil to surfaces of the sheets, and securing the sheets formed to a transparent surface covering. This process has been described in detail in *Plastics* March 1929, p 134.

Patent 1,675,642 dated July 3, 1928 makes imitation mother-of-pearl by mixing pearl essence into a pyroxylin-plastic casting dope, casting the dope into film, forming a stack comprising sheets of the film and crinkled sheets of plastic interlaid therewith, welding the stack into a block, sheeting the block and forming certain of the sheets into relatively smaller pieces, forming a stack comprising certain of the sheets interlaid with the pieces, and welding the stack into a block.

The Production of Slabs and Tubes of Imitation Mother-of-Pearl

In carrying out the process

of patent 1,638,529 dated Aug. 9, 1927 a pyroxylin plastic composition, such for example, as that commonly known to the trade as celluloid, is prepared as described in the patent 1,607,624 so as to thoroughly incorporate therewith fish scales, as well as to homogeneously distribute the pigment in a uniform directional trend throughout the mass. The lustrous, polished or calendered tubes directly obtained from the extruding operation, and without the further treatment described in the patent of stacking, cutting and pressing of a stack of such sheets to form a block, is introduced into a die and subjected to a sufficient pressure to



To get the peculiar bizarre effect, colored sheets of celluloid are subjected to a heated die. (U. S. P. 1,638,529)

upset the trend of the pigment and the structure of the material to a point considerably beyond the point of extreme penetration of the face of the die into the upper face of the sheet treated. During the die pressing operation, of course, the material is heated sufficiently to necessary upsetting of the structure and trend of the pigment in the structure can be insured, for example, a temperature of approximately 200° F., is desirable for this purpose.

Upon the completion of the pressing operation the article, either in the form of a sheet, tube, rod or the like, depending upon the particular configuration of die box and die employed, is removed from the die box and either subjected to a grinding, buffing, turning or polishing operation to remove partially or entirely the superficial pattern on the product removed from the mold to produce a smooth, continuous polished surface or a substantially smooth surface of different design and appearance from the pattern of the die employed.

Second Pressing

Instead of grinding or buffing the product removed from the die, it may be subjected to a repressing operation in a second die having smooth, highly polished surfaces in order to still further upset the trend of the pigment or variegated color effects in the plastic which results from the first pressing operation and produces a smooth or substantially smooth, continuous or substantially unbroken surface in which the facets of the pigment employed or the layers or mottled portions of the mass however, will have a quite different appearance from that obtained by the grinding or buffing operation such as above described and yet be entirely different from the appearance of the plastic originally subjected to the first pressing action. It will be found that the characteristics and appearance

of the finished product so obtained will be entirely changed from that possessed by the original Higgins product which had been subjected to the treatment and depending upon the character of the pattern or figure of the face of the die, there will have been produced a corresponding effect in the finished product which is entirely unique and uniform in successive articles produced in the same die.

What the Drawings Show

Referring to the drawings, numeral 1 designates a die box and 2 a die adapted to reciprocate with respect thereto and to be forced therein under great pressure. The lower face 3 of the die is, as shown, embossed or engraved to produce a multiplicity of raised portions a and depressed portions b, the maximum difference between the varying levels of the surface or maximum elevation being not less than 1/64 of an inch in order to produce a distinct or marked upsetting or distortion of the structure or trend of the pigment particles of the material treated in the area below the point of maximum penetration of the raised portions of the die into such material.

In Fig. 3 the bizarre effect is obtained by subjecting a multiplicity of sheets each of a different color to the action of an engraved or embossed die such as employed in Fig. 1, the reference letter c designates the red portions of the product, d the black portions and e the portions wherein the color is some blend of these two colors.

In Fig. 4 is illustrated a split die of tubular shape for the production of tubes of the improved product, the reference numeral 4 designates the upper half and 5 the lower half of such die, each being engraved or embossed with any desired design or pattern and 6 is the mandrel which serves to support the plastic employed when it is desired to produce tubes. If rods are to be produced, a split die is

likewise employed, but no mandrel is required.

Artificial Coral

Natural red coral has been valued from remote times for jewelry and ornamentation. In order to make artificial coral it is necessary to imitate the form, color and hardness of the natural coral. According to Worden, Nitrocellulose Industry Vol. 2 page 691, the form is duplicated by making an electro from natural coral and using this form as a mold for the plastic composition. Patent 150,722 dated May 12, 1874 uses a composition consisting of gun-cotton, twenty-four parts; five parts gum-copal, ten parts alcohol, one-twentieth part perchlorid of tin, one part gum-shellac, twenty parts ether, one-fortieth part perchloride of gold, one part and of magnesium, one-twentieth part protochlorid of tin, one part oxid of mercury. The coloring matter is varied according to the shade required.

Pyroxylin and Mica

Very brilliant effects of fused glass and matt silver are produced by the process of patent No. 294,661 dated Mar. 4, 1884. The mica is divided up either by rasping, grating, or grinding and then is sifted through a fine sieve, to reject the very finely powdered portions, that first pass through the meshes of the sieve. The mica is next mixed with the soluble pyroxylin, both being in a fine state of division, and if camphor is intended to be used as the solvent of the pyroxylin, this may be now added in finely divided state, and thorough mixture effected in any convenient manner, viz., by a tumbling-box or stirring-machine.

A variety of tints of color may be incorporated with the compound after it has commenced to pass into the plastic state, caused by the addition of alcohol or wood-spirit, (rectified, the higher the rectification the better,) when the compound has been submitted to the process of rolling between warmed rolls

(Continued on page 516)

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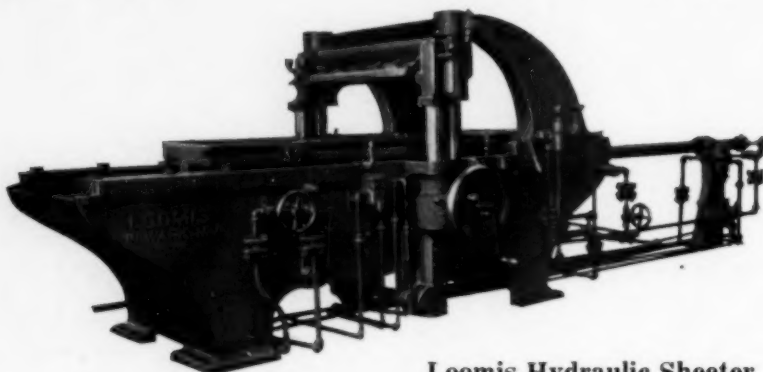
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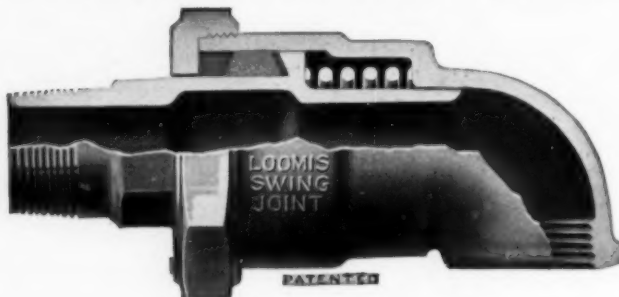
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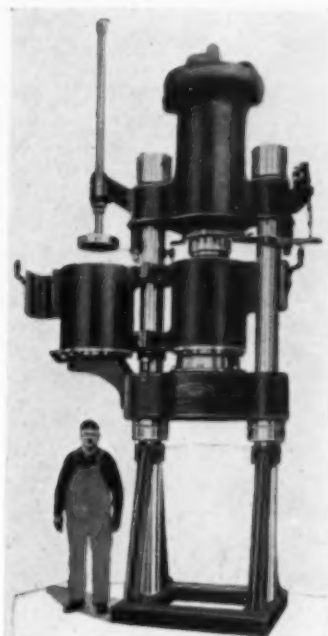
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Synthetic Resins and Cellulose Esters Combined

Glycerol-phthalic acid resins condensed with China wood oil, yields soluble products entirely compatible with cellulose nitrate lacquers

ANOTHER way to cut down on the use of the relatively expensive cellulose esters to produce a lacquer base, is suggested by a process worked out at Montclair, N. J.

A combination of cellulose esters with synthetic resins is described in a recent patent issued to Harry M. Weber and assigned to the Ellis-Foster Co., of Montclair, N. J. (U. S. P. 1,690,515, Nov. 6, 1928).

As an example of a method of preparing the resinous compositions, the following is cited: 94 parts of glycerol 160 parts of phthalic anhydride 80 parts of China wood oil were heated in a closed vessel fitted with a short air-cooled reflux vessel fitted with a short air-cooled reflux condenser and having means for mechanically agitating the reacting constituents to a temperature of 235° C. Water was evolved throughout the reaction.

Suitable for Films

The product was a dark yellow hard brittle resin containing a slight amount of free oil. The resin had a melting point of 73° C., and an acid number of 56. It was soluble in a fifty fifty butyl acetate butyl alcohol mixture and was compatible with nitrocellulose in all proportions. A film formed from butyl alcohol butyl acetate solution of nitrocellulose and the resin was extremely tough, but slightly turbid, due to the small quantity of free oil present.

Resins prepared from the fatty acids of the drying or semi-drying vegetable oils are superior to those prepared from the drying oils themselves in

that they can be prepared with greater ease and with less danger of polymerization with consequent loss of the materials and a homogeneous resin is produced containing no free oil which would interfere with the production of suitable articles for all purposes when blended with a cellulose ester or ether.

As an example of a resin of this character

94 parts glycerol
160 parts phthalic anhydride
80 parts fatty acids (obtained from soya bean oil)
were heated up to a temperature of 265° C., and the product held at this point until a resin of suitable hardness was obtained.

The product as obtained was a dark brittle slightly tacky resin having a melting point of 71° C., and an acid number of 17. The resin was soluble in butyl acetate and butyl alcohol mixture and was readily blendable with nitrocellulose.

Films produced from a mixture of the resin and nitrocellulose were clear, transparent, tough and were resistant to weathering conditions.

Resins can also be produced from mixtures of fatty acids of vegetable oils and vegetable oils with an organic acid and an alcohol which are suitable for use for the purposes of the present invention.

For example, a resin was prepared from

94 parts of glycerol
160 parts of phthalic anhydride
20 parts of fatty acids from castor oil
60 parts of corn oil
by heating in the vessel describ-

ed in Example 1 up to a temperature of 260° C. The resin so produced was light in color, somewhat turbid, hard and brittle with indications of containing a small amount of free oil.

When dissolved in a mixture of equal parts of butyl alcohol, butyl acetate, and blended with a similar solution of nitrocellulose, it was necessary to add a small quantity of acetone in order to obtain a clear solution.

A film prepared from such solution was slightly turbid, tough and resistant to weathering conditions.

Use of Blown Oils

Blown oils such as blown castor oil, blown rapeseed oil and the like may also be used in the preparation of a resinous complex, and resins prepared from this material are superior in that they can be prepared at a lower temperature than those prepared from the fatty acids, or the vegetable oils, or mixtures of these, and produce a product which weathers extremely well. They have the disadvantage that they produce a comparatively dark colored resin, and therefore are not as desirable for the preparation of compositions for use in clear lacquers or light colored plastic compositions, but are confined to the preparation of pigmented lacquers, enamels, or dark colored plastic compositions where color is not of importance.

94 parts of glycerol.
160 parts of phthalic anhydride.
80 parts of heavy blown rapeseed oil.
were heated in the apparatus mentioned in Example 1 to a

(Continued on page 518)

The World's Recent Progress in Synthetic Resins

A complete and condensed account of patents
from the most important industrial countries

By Dr. Aladin

The patents that are listed here are all of recent origin and disclose the progress realized throughout the civilized world in this field. The dates, except in case of U. S. patents, are those of application. There will be a total of over 450 patents in this review. Publication began in April, 1929.

c. Phenol-formaldehyde condensation products made with Neutral Condensing Agents

(Continued from August Issue)

Serial No.	Patent Number and Date	Inventor or Assignee	Title of Invention	Subject Matter of Invention
88	Can. Pat. 262,194	Kunstharzfabrik Regal & Co. and R. R. Singer	Resinous condensation products from phenol and formaldehyde.	Water-clear resins are obtained by the use of chloroamino-aldehyde as condensing agents—for example dichloroamino-acetaldehyde.
89	Can. Pat. 262,930	Kunstharzfabrik Regal & Co.	Resinous condensation products from phenol and formaldehyde.	Formaldehyde is allowed to act on phenol at elevated temperatures in presence of an indophenol dyestuff, such as is obtained from para-amino-dimethylaniline. If desired the color can afterwards be destroyed by means of acids. When further hardened the products are insoluble.
90	Ger. Pat. 429,043 2-8-1924 Frdl. XV. 1215	Kunstharzfabrik Regal & Co. J. Novak and J. Rostal	Resinous condensation products from phenol and formaldehyde.	Ozone or ozonides serve as condensing agents.
91	Ger. Pat. 441,708 5-20-1925 Frdl. XV. 1216	A. Regal	Preparation of phenol-formaldehyde condensation products with a condensing agent.	Indophenols are used as condensing agents. These are formed in the phenol by adding thereto a para-amino-aryl compound such for example as para-aminophenol followed by slight oxidation. The color thus formed acts both as a catalyst as well as to dye the finished product, although it can be removed by acting on the product with an acid.
92	Ger. Pat. 442,211 7-23-1921 Frdl. XV. 1203	G. Petroff	Preparation of liquid condensation products from phenols and formaldehyde.	Lead acetate, in an amount of 10% of the reacting products is employed as a catalyst.
93	Brit. Pat. 227,468 1-12-1925	Kunstharzfabrik Regal & Co. J. Novak and J. Rostal	Resinous condensation products from phenol and formaldehyde.	See German P. 429,043 (No. 90).
94	Brit. P. 254,888 7-29-1925	A. Regal	Preparation of resinous condensation products from phenols and formaldehyde.	Catalysts employed are indophenols, which may be prepared right in the phenol by the addition of para-nitrosophenol or para-nitrosodimethylaniline, formaldehyde being also used to condense with the phenol. This obviates the necessity of employing oxidizing agents. Indamines may also be used (for example such products as may be obtained from phenol and para-phenylenediamine and aniline).
95	Brit. Pat. 255,692	S. Karpen Bros.	Preparation of resinous condensation products from phenols and formaldehydes.	See Can. P. 268,608 (No. 86).
96	Brit. Pat. 256,394 7-29-1925	A. Regal	Preparation of Synthetic Resins.	Phenol is condensed with formaldehyde in presence of compounds derived from the action of formaldehyde on dialkylated aromatic amines such as dimethylaniline. The products are soluble resins but are capable of being hardened.

Serial No.	Patent Number and Date	Inventor or Assignee	Title of Invention	Subject Matter of Invention
97	Brit. Pat. 265,033 3-20-1926	E. J. P. de Tarny	Preparation of condensation products from phenols and formaldehyde.	See Fr. P. Addition 30,787 to F. P. 563,777. See Fr. P. 628,130 (No. 102).
99	Fr. Pat. Adn 30,787 to 563,777 4-16-1925	Verreries de Folembray	Plastic Material from phenols and aldehydes.	Phenol or cresol are condensed with formaldehyde with the use of alkaline earth chlorides, such as calcium chloride, as catalysts. Fillers are then added and the materials hardened by heat and pressure.
100	Fr. Pat. 591,920	Kunstharzfabrik Regal & Co.	Preparation of resinous condensation products from phenols and aldehydes.	See Ger. P. 429,043 (No. 90).
101	Fr. Pat. 610,108 1-15-1926	A. Regal	Preparation of condensation products of phenols and aldehydes with a catalyst.	See Ger. P. 441,708 (No. 91).
102	Fr. Pat. 628,130 1-27-1927	G. Petrov	Preparation of phenol-aldehyde condensation products.	Phenols and aldehydes are condensed with the use of alkalies, the sodium salt of para-toluenesulfonchloramid, etc. The resin formed is evaporated under reduced pressure at around 60-70° C. and hardened by further heating, with or without the addition of such accelerators as octo-hydroanthracenesulfonic acid or sodium alcohulates or phenates.
103	Fr. Pat. 643,439 11-7-1927	Bakelite Corp.	Preparation of phenolic resins.	Phenol is condensed with anhydro-formaldehydeaniline or its derivatives. Hexamethylenetetramine may replace the same.
104	Swiss Pat. 116,591	Kunstharzfabrik Regal & Co.	Preparation of resinous condensation products from phenols and formaldehyde.	See Ger. P. 429,043 (No. 90)

d. With Diverse Condensing Agents

105	U. S. P. 1,609,367	C. Kulas & Co. (Pauling)	Preparation of phenol-aldehyde resins	Cresol is heated with formaldehyde in presence of aqueous hydrochloric and until incipient stratification begins, whereupon further quantities of cresol and formaldehyde are added and the mixture is then made alkaline with strong ammonia and the mass boiled for some time. Deydration is then carried out. The products are soluble resins capable of hardening. Oxybenzyl alcohols or dioxymethyl methanes may also be added.
106	U. S. P. 1,658,828	Chem. Fabrik Dr. K. Albert G. m. b. H. (A. Amann)	Resins from formaldehyde and rosin	Formaldehyde, either in solution or as a solid (paraform) is introduced into melted rosin and the mixture is heated (under pressure if desired) to 135° C. The resultant reaction product when combined with phenol in presence of acid or alkaline catalysts yields resins suitable as copal substitutes.
107	U. S. P. 1,678,107	Selden Co. (L. Deutsch and J. Thorn)	Preparation of light hard infusible materials from phenoplastics	Condensation products made with alkaline catalysts (including carbonates) from phenols and aldehydes are treated with phosphoric acid or boric acid or their salts, yielding light-colored resins whose color is permanent if before hardening the mixture is acidified with organic acids.

Serial No.	Patent Number and Date	Inventor or Assignee	Title of Invention	Subject Matter of Invention
109	Ger. Pat. 423,032 5-10-1922	O. Ehrlich	Preparation of light colored and stable phenolic condensation products	The soluble intermediate products (resols) are treated with synerizing agents, such as lactic acid, acetic acid, tartaric acid, boric acid or their soluble salts, whereafter the excess phenol in the resin is washed out of the same by shaking it in water.
110	Ger. Pat. 424,074 7-20-1921 (Frld. XV 1114)	C. Kulas and C. Pauling	Method for preparing hardenable resinous condensation products from phenol and aldehydes	To a two-phase resin, such for example as that produced by German patent 414959, while still in the soluble and fusible stage, amyl alcohol and camphor oil are added, the mixture boiled once more and the resin then hardened.
110	Ger. Pat. 437,612 3-26-1924 (Frld. XV 1263)	G. Petroff	Substitutes for resins used in lacquers and varnishes.	Phenol and formaldehyde are condensed either in presence of acid or alkaline condensing agents until the mixture stratifies. Naphthenic acids are then added while the material is heated to 40°-50° C. The semifluid alcohol-soluble resins are employed as the base for lacquers and oil varnishes.
112	French P. 607,655 3-19-1925	Cie des Mines de Vicoigne, Noeux et Drocourt	Preparation of resinous condensation products from tar containing phenols, and formaldehyde	The oils are condensed with formaldehyde in the presence of any of a large variety of catalysts, such as organic acids, alkalies or acid-salts, for example ammonium chloride. The uncondensable neutral components of the oil are subsequently removed by steam. The products are soluble and fusible, but hardenable by the usual procedures.
113	Austrian P. 100,049	C. Kulas and C. Pauling	Preparation of condensation products from phenols and aldehydes	The initial condensation is effected with acids until a resin forms. Then fresh amounts of phenol and formaldehyde are added and the mixture neutralized with a large excess of alkali and the condensation completed, yielding fusible soluble resins.
114	Austrian P. 104,707 6-15-1926	O. Ehrlich	Preparation of light-colored stable condensation products	Cf. German P. 423,032 (No. 109).
115	Austrian P. 104,724	Bakelite Ges. m. b. H.	Phenol-aldehyde condensates	Phenols and aldehydes are condensed to form oily products by use of alkaline catalysts. On adding an equivalent amount of acid resols convertible into hard infusible products result.

e. Without Condensing Agents

116	U. S. P. 1,645,693	C. Ellis	Cold-moldable products from ortho-cresol-aldehyde resins.	Ortho cresol is condensed with an excess of an aldehyde such as formaldehyde, paraformaldehyde, paraldehyde, furfural, acrolein or butyraldehyde. After mixing with fillers the material is molded and then hardened by heating.
117	U. S. P. 1,681,368	Bakelite Corp.	Preparation of acid-free resinous condensation products from phenols and aldehydes.	Covers the after-treatment of resins while dissolved in alkalies with acids in the presence of hydrotropic substances such as soaps, etc. The crude condensation products are placed in colloidal suspension by means of strong alkaline solutions (not in excess however) and are precipitated therefrom by the addition of salts such as sodium chloride, alum, aluminum sulphate, sodium salicylate, potassium chloride, etc. The phenolic impurities remain in solution, as do also incomplete condensation products.
118	U. S. P. 1,681,369			

Extruded Artificial Pearl Products Possess Particularly Pleasing Appearance

Orientation of the fine pearly particles to insure their presenting different surfaces to the light is the basis of the process

IN order to obtain extruded plastic articles having the desired nacrous and pearl-like effect without having them uniformly streaked and hence not as attractive as might be desired, Jean Paiseau, of Paris, France, extrudes them through a nozzle in which there are obstructions so that the fish scales in the material are arranged in hereogeneous relationship where-by the effect is much more beautiful than if the material were merely molded or extruded in the ordinary way. (U. S. P. 1,700,208; Jan. 29, 1929.)

The process is applicable to all of the thermoplastic compositions, and especially to the cellulose esters such as nitrate and acetate, as well as to the case in plastics.

Extrusion

According to known practice, if a plastic mass of this kind while still soft is forced through a nozzle this will afford at the discharge end of the nozzle strips in which the brilliant particles will all be parallel with the surface of the said strips.

For this reason, the strips have a uniform smooth and brilliant aspect, and their appearance and lustre, in the case of pearl essence resembles the real pearl rather than the mother of pearl, due to the absence of all streaks.

The present invention is based upon the fact that if there is an obstacle in the nozzle which hinders the issue of the said plastic mass, this obstacle will cause eddies or whirls in the said mass which will subsist for a certain time and will cause a partial confusion of the said particles. The particles now more or less oblique to the sur-



Extrusion Nozzle used by Jean Paiseau in obtaining striated pearl effects.

face of the strip, will reflect the light in different directions and will give to the eye the impression of streaks, so that the surface of the resulting pearly substance will not appear smooth, but will be irregular and cockled.

Based on the above data, the invention comprises in principle a suitable press in which the plastic mass containing brilliant particles may be raised to the softening temperature by proper means. The press operates in connection with a special nozzle whose width will depend upon the conditions of manufacture, and whose thickness may attain one or two centimeters or more.

The nozzle shown in the illustration is characterized in that on a part of its length comprised between the ends there is provided a projecting part 2 forming an irregular surface. The smooth intake part of the nozzle polarizes the brilliant particles, and the length of this should be such that this result be attained.

The irregular part following the first portion comprises suitable projections in calculated size and number so that the desired regions of confusion will be obtained. Each of the projections has preferably an outline which diminishes towards the front, and which is sufficiently abrupt at the rear to produce the desired result.

The nozzle thus formed is adapted for different uses. If the cross section of the nozzle is circular or rectangular, it can be used for the manufacture of round or square rods of a pearly nature which can be used after drying.

To obtain sheets of pearly substance by cutting up a block which is manufactured by the known process, a nozzle of larger size, whose width at least equals the width of the block press, is used.

With the use of a nozzle of such size, the plastic substance issues in the form of a thick band of 1 or 2 centimeters in thickness. This band is cut up, as fast as formed, into sheets having the size of the block press in use.

The pieces thus obtained are piled up in the block press, after which they are formed into a compact mass by heat and pressure, thus producing a block which may be cut into sheets.

Solvent for Acetylcellulose; Anhydrous Alcohol and Acetone. Louis Etienne Clement, assignor, to du-Pont-Pathe Film Mfg. Corp., of Wilmington, Del. U. S. P. 1,713,997; May 21, 1929.

The present invention relates to a new solvent for acetylcellulose consisting of a mixture of anhydrous alcohol, which in itself is not a solvent, with a suitable solvent for acetylcellulose such as acetone, the acetates or formates of the different alcohols (ethyl, methyl and the like) or various other organic esters which are direct solvents for acetylcellulose.

Example

	Parts by vol.
Ethyl alcohol, anhydrous	50
Acetone pure	50

Anhydrous Alcohol as Solvent for Nitrocelluloses. Louis Etienne Clement, assignor to du-Pont-Pathe Film Mfg. Corp., of Wilmington, Del. U. S. P. 1,713,512; May 21, 1929.

The present invention relates to a new solvent for nitrocellulose consisting of a mixture of anhydrous alcohol, which in itself is not a solvent, with a suitable solvent for nitrocellulose such as acetone, the acetates or formates of the different alcohols (ethyl, methyl, amyl and others), or various other organic esters which are direct solvents for nitrocellulose.

The following mixture may be given, by way of example, as affording excellent results:

	Parts by Vol.
Ethyl alcohol, anhydrous	80
Acetone pure	20
or,	
Amyl alcohol, anhydrous	80
Amyl acetate	20

Vulcanization + Hydraulic Cement = Plastic

Inexpensive peculiar type of product, based on the vulcanization of gilsonite and the setting of an hydraulic substance, is described in considerable detail

A peculiar sort of molded composition, based both on the vulcanization as well as on the setting of a hydraulic cement has been patented by Charles E. Turrell, of Lakewood, Ohio. In U. S. Patent 1,707,585, April 2, 1929, assigned to the Monoblock Co., of Dover, Ohio, the process is described as being aimed at the production of a hard molded product from mainly gilsonite and mineral rubber in admixture with Portland cement and other fillers. The inventor states:

"In producing my improved compound, I employ a number of ingredients, certain of which are particularly important by their action in shaping or determining the characteristics of the finished product and which undergo certain chemical changes and make it possible to eliminate expensive operations which heretofore have added much to the cost of the finished product without producing a product superior to that obtained from my improved compound and the process carried out by me in the production of the compound and the finished article. Among the ingredients, I employ an inexpensive base, preferably a bituminous product such as gilsonite, to which is added a fibrous substance such as cotton floss, one or more fillers including a cement, and a certain amount of vulcanizable rubber with sulphur. Just enough rubber and sulphur are added so that the rubber will vulcanize during the mixing and by the heat generated in the mixing, the rubber adding to the toughness and removing the brittleness of the bituminous base, care being exercised that

For many purposes, such as structural material, paving blocks and the like, only the less expensive materials are available. A great future for plastics lies in those fields where huge consumption is assured.

the amount of vulcanized rubber thus produced does not destroy the plasticity of the compound nor interfere with the subsequent molding. However, by the addition of the rubber and sulphur a chemical reaction takes place in the mixing, the chief function of which is to reduce the brittleness of the gilsonite or other base.

For Battery Boxes

"While the rubber performs the desirable functions mentioned above, it would have one undesirable property, namely the reduction of heat resistance, which, if not counteracted would be detrimental for certain uses of the compound, such as, for example, the production of storage battery boxes, but this is overcome by the addition of the cement which sets or hardens shortly after the molding operation and increases the tensile strength and the resistance to heat. Thus the rubber, with the addition of the sulphur, undergoes a certain chemical change during the mixing, in the production of the plastic compound, and the dehydration or the setting and hardening of the cement results in another chemi-

cal change after the molding operation, both of these chemical changes having the distinct advantages pointed out above and taking place without any special treatment which would add to the cost of the product.

"In addition to the ingredients above mentioned, I prefer to add a small percentage of wax or oil to prevent the compound sticking to the rolls in the mixing operation and to the parts of the mold in the molding operation and to dispense with the necessity of lubricating the parts of the mold as has frequently been required heretofore. Additionally, I may add as a filler an inert mineral dust, such as shale flour or slate flour, and there may be added to advantage so-called mineral rubber, such as genasco, which consists of a bituminous substance, such as gilsonite, blown with asphalt oil. This acts as a binder and assists in reducing the brittleness of the bituminous base.

"The rubber which is added is preferably reclaimed devulcanized rubber which is usually obtained by grinding and devulcanizing waste rubber products such as tires.

"Good results have been obtained by the admixture of the following ingredients mixed in substantially the following proportions by weight:

	Parts
Gilsonite	81
Mineral rubber	10
Wax or oil	4
Cotton floss	40
Portland cement	25
Shale or slate flour	20
Reclaimed rubber	8
Sulphur	3

(Continued on page 519)

Technical Abstract Section

A Concise Review of Patents and Literature

Composite Product and Method of Making Same. Harold Gray, assignor to the B. F. Goodrich Co., New York, N. Y. U. S. P. 1,697,275; Jan. 1, 1929.

The present invention is based upon the discovery that turpentine when acted upon by certain reagents becomes thickened, particularly under the influence of heat, and in this thickened condition possesses excellent bonding properties, these properties being especially good for bonding metals to rubber.

Example 1.—Into 100 parts by weight of turpentine 50 parts of stannous sulfate were added and the admixture heated for 24 hours at 110° C. The reaction product thus prepared was painted on a clean surface of a steel plate and a coarse-woven fabric frictioned with a vulcanizable rubber composition was superposed upon the coated metal, the assembled structure being subjected to vulcanizing temperatures under pressure. The composite construction when submitted to test upon a Cooney machine showed a friction pull of 14 pounds per inch. This is approximately seven to ten times the bonding strength obtainable with the best rubber cements when employed in a similar construction.

6. A composite construction comprising rubber and metal integrally united together through the intermediary of a composition comprising the reaction product of turpentine and a substance selected from a group comprising hydrochloric acid, hydrobromic acid, sulfuric acid, phosphoric acid, cupric chloride, mercuric chloride, aluminum chloride, antimony trichloride, phosphorous trichloride, phosphorus oxychloride, benzo trichloride, trichloroacetic acid, antimony tribromide, ferrous bromide, cupric bromide, cupric iodide, stannous sulfate, ferrous sulfate, aluminum sulfate, and the like.

Process for purifying phenolformaldehyde resins. Fritz Seebach, assignor to Bakelite Gesellschaft Mit Beschränkter Haftung, of Berlin, Germany. U. S. P. 1,697,885, Jan. 8, 1929.

Example 1.—100 kilograms or resinous phenol formaldehyde condensation product in small pieces are mixed with 200 litres of limewater (containing 6 kilograms of quicklime) 2-3 hours in a ball mill or an agitator. Thereby the resins are converted into a colloidal solution, and afterwards are precipitated from this solution. As soon as the resinous condensation product is transformed into a fine powder it is separated from the liquid, for instance by filtration or decantation and the resin is washed with water. From the wash-

ing water the extracted or dissolved substances can be precipitated by means of acids, as hydrochloric acid, and the liberated phenols may be used again for the preparation of the condensation products. The resin may be dried at 30-40 degrees centigrade.

3. The process for purifying fusible, soluble phenolaldehyde condensation products which consists in combining the uncombined phenols and by-products with a mixture of compounds of alkali metals and such metal compounds higher than alkali metals which form in the presence of alkaline compounds soluble compounds with the phenols and by-products, forming the resin by mixing thoroughly a colloidal solution and precipitating the resin by means of water.

Cellulosic Esters Containing Halogen-Substituted Fatty-acid Groups.

Hans T. Clarke and Carl J. Malm, assignors to Eastman Kodak Co., Rochester, N. Y. U. S. P. 1,698,049; Jan. 8, 1929.

A reaction bath is prepared by warming at 60° to 65° C. for 1 to 2 hours the following mixture,—8 parts by weight of cellulose, 40 parts by weight of chloroacetic anhydride, 20 parts by weight of chloroacetic acid and .05 parts by weight of magnesium perchlorate trihydrate. For convenience we shall hereinafter refer to this as the standard bath. Into this bath there are thoroughly stirred 15 parts by weight of alpha bromo stearic acid and 4 parts by weight of acetic acid. By maintaining a temperature between 60° and 65° C., a clear dope forms in about 6 hours, indicating the completion of the reaction. The product is isolated by pouring into methyl alcohol and washing the precipitate with this same liquid. The cellulose-aceto-alpha-bromo-stearate thus produced contains 11.3% of bromine and is soluble in acetone, chloroform, benzene, or mixtures of these, and can be deposited from its solutions in the form of transparent flexible films which are substantially non-inflammable, that is, will not burn with a sustained flame when held in the presence of an igniting flame.



Up to 1000



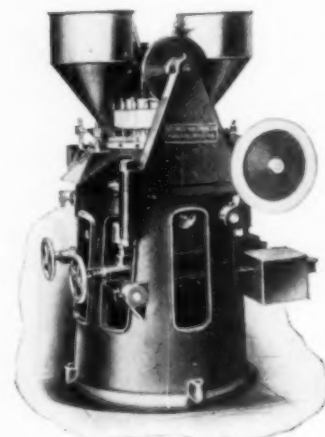
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Process of Treating Bituminous Material to Form Plastics. Mark Ray Cone, assignor to the Union Trust Co., Cleveland, O., U. S. P. 1,698,877; Jan. 15, 1929.

1. In the art of treating bituminous material to form a plastic mass, the process which consists in spraying the material at a temperature above the fusing point to subdivide the same into fine particles, preventing contact between the said particles until the surfaces thereof have cooled below the melting point, immersing said particles in heated water, cooling the same gradually to normal atmospheric temperature and removing the material forms a moist, plastic paste.

Condensation Products of Methylol

Compounds of a Urea. Martin Luther and Claus Heuck, assignors to I. G. Farbenindustrie Aktiengesellschaft, of Frankfurt-on-the-Main, Germany. U. S. P. 1,699,245; Jan. 15, 1929.

Example 1. Dry dimethylol-urea obtained by condensing urea and formaldehyde in the presence of alkali is suspended in its own weight of methanol. About 0.5 per cent of the quantity of dimethylol-urea of normal methyl alcoholic hydrochloric acid is then added while stirring and the mixture heated to boiling. After boiling for 5 to 10 minutes the product is neutralized and filtered, while hot. On cooling, the new condensation product separates in the form of colourless needles which, when recrystallized from methanol or ethyl alcohol, melt at 100° to 102° C. The new product is soluble in alcohols and esters and very readily soluble in water.

1. As new articles of manufacture, crystalline condensation product of methylol compounds of a urea, which are readily soluble in the usual solvents for lacquers and which are obtainable by condensing a methylol compound of urea in an alcohol with the aid of acid condensing agents under mild conditions the condensation being stopped instantly after all of the initial material is dissolved and cooling the reaction mixture.

4. The process of producing crystalline condensation products of methylol compounds of a urea which comprises condensing dimethylol-urea in an alcohol with the aid of an acid condensing agent, stopping the condensation instantly after all of the initial material is dissolved.

Matrix Board containing cellulose derivatives. Howard J. Blake, of Boston, Massachusetts. U. S. P. 1,699,579; Jan. 22, 1929.

1. A fibrous flong or mat for a matrix blank having a coating consisting of thio-carbonate of cellulose otherwise known as cellulose xanthate.

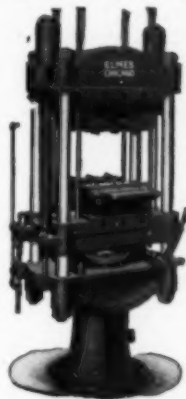
Phenolic condensation products. Archie J. Weith, assignor to Bakelite Corporation, of New York, N. Y. U. S. P. 1,699,727; January 22, 1929.

A phenolic resin of the permanent fusible and soluble type is first prepared in well-understood manner, using the approximate ratio of 7.5 phenol groups to 6.0 methylene

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This automatic tablet machine is designed for producing tablets from powdered materials. It is provided with a special form of pressure regulator, which is adjustable to suit product and accommodate a variety of sizes in tablets.

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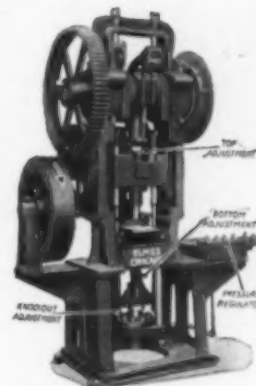
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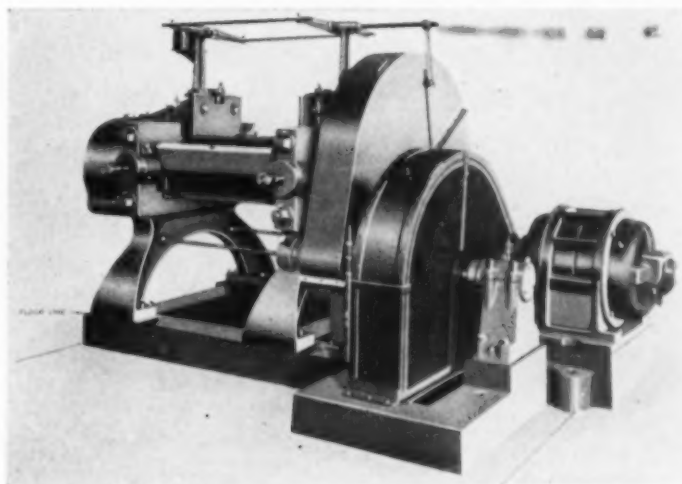
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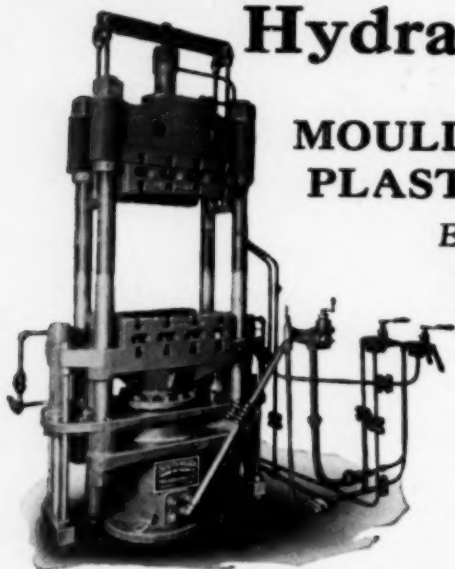
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groups, preferably with an acid catalyzer. This resin is thoroughly washed with water until the catalyzer is substantially removed. It is then dried at a temperature sufficient for the removal of water and volatile products, and may be tested or analyzed to determine the precise phenolmethylenes ratio.

Phenol is then added and incorporated by thorough stirring. The amount of phenol thus added may be varied rather widely with corresponding adjustment of the amount of methylene body introduced in the succeeding stage) but it is preferred to introduce it in such quantity as to establish a ratio in the resulting mix of about 9-12 phenol groups to 6 methylene groups.

To this mixture is added a methylene-containing body, such as a solution of formaldehyde, in an amount sufficient to restore the proportions suitable for the infusible product. As stated above, these proportions are approximately equimolecular, or in a specific instance where a transparent product was desired, 6.4 phenol groups to 6 methylene groups. In conjunction with the formaldehyde it is preferred to introduce a basic catalyzer, preferably ammonia, either as such or directly in the form of hexamethylenetetramine, hexamethylenetetramine-tri-phenol or the like, in proportion equal to about 0.1 percent by weight of the dry resin.

The resulting mixture is thoroughly stirred, poured into molds, and permitted to stand at about 40° C. After hardening to a firm jelly it is removed from the molds and placed on drying racks in heated kilns, where it slowly hardens to a solid hard mass, which may be sawed, cut, ground and otherwise fabricated into any desired form.

1. Process of making a phenolic condensation product comprising commingling a preformed phenol-methylene resin of the fusible type and a phenolic body, and incorporating with the mixture sufficient methylene-containing body to provide a higher ratio of methylene to phenol than existed in the fusible resin, thereby producing a reactive composition transformable by sufficient heat to an infusible product.

3. A potentially reactive composition comprising a pre-formed fusible phenol-methylene resin, sufficient added phenolic body to provide about 9-12 phenolic groups for every 6 methylene groups, and sufficient methylene-containing body to establish an approximately 1:1 ratio between the total phenolic and methylene groups in the mass.

4. An infusible phenolic condensation product resulting from the reaction of a preformed fusible phenol-methylene resin, sufficient added phenolic body to provide about 9-12 phenolic groups for every 6 methylene groups, and sufficient methylene-containing body to establish an approximately 1:1 ratio between the total phenolic and methylene groups.

Cellulose Aceto-chlorbenzoates. Hans T. Clarke and Carl J. Malm, assignors to Eastman Kodak Co., Rochester, N. Y. U. S. P. 1,704,283; Mar. 5, 1929.

As an illustration, a bath may be prepared by mixing 15 parts by weight of monochlor acetic anhydrid, 10 parts of ortho chlor benzoic acid, 2 parts of acetic acid and 0.02 magnesium perchlorate. Into this are stirred 2 parts of cleaned cotton and the reaction mass kept at 65° C. until it becomes homogeneous in appearance. This ordinarily occurs after about 7 hours at the above temperature. The aceto-orthochlorbenzoate of cellulose thus obtained is soluble in chloroform and insoluble in acetone. It may be separated from the reaction mixture in the usual way. When purified, a white granular precipitate is obtained. From chloroform solutions this yields transparent films or coatings.

By using only 1 part by weight acetic acid instead of 2 and employing 5 parts of magnesium perchlorate in the foregoing example we have obtained a mixed cellulose ester soluble in acetone. From its acetone solutions this cellulose aceto-orthochlorbenzoate yields transparent films by spreading and evaporating.

1. A halogen substituted cellulosic organic acid ester which contains a proportion of from 1 to 3 acid groups for each six carbon atoms of the cellulosic group, sufficient to impart solubility in a substantially neutral volatile organic solvent, at least part of the acyl groups corresponding to a monocarboxylic acid containing a halogen substituted benzene ring.

Process of making Cellulose Ethers.

Helene Sessler, assignor to C. F. Boehringer & Soehne G. M. B. H., Mannheim-Waldhof, Germany. U. S. P. 1,704,304; Mar. 5, 1929.

This invention relates to the art of manufacturing cellulose ethers from cellulose materials, such as cellulose proper, its conversion products and derivatives, its object being to produce such ethers in a manner adapted for commercial production and without changing the fibrous structure of the cellulose material.

Example

Ten grams of cotton cellulose are submitted to the action of a mercerizing solution by immersing the same in a bath of the solution of 20 per cent strength and the resultant product is exposed in a vacuum of about 10 millimeters Hg to a stream of dimethylsulfate vapors, the dimethylsulfate boiling at about 70° centigrade. The distillation of the sulfate is continued for two and one-half hours. The product resulting from this process is a dimethyl-cellulose in which the fibre structure has been preserved and which dissolves uniformly in the organic solvents such as ethylene-chlorhydrin, methylene-chlorid and the like without leaving insoluble residues.

10. The process which consists in subjecting cellulose to the action of a vapor-stream of dimethyl-sulfate in the presence of a basic substance below atmospheric pressure.

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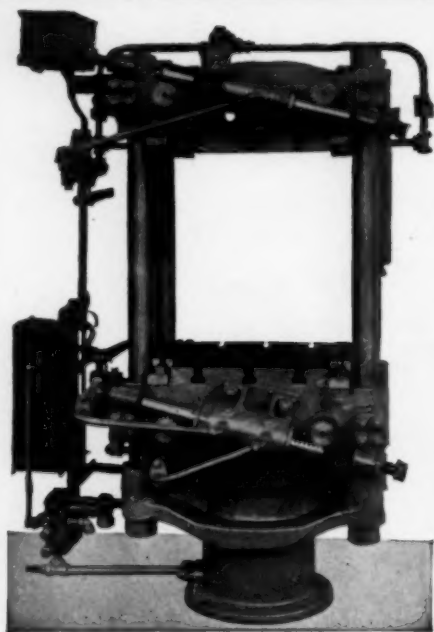
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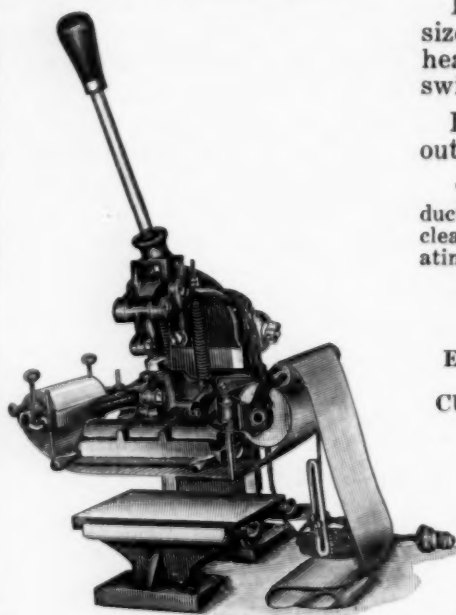
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Pyroxylin Imitations

(Continued from page 502)

and the mass has assumed the plastic state. At this stage of the process, by means of a spray-bottle charged with alcohol and coloring matters, the plastic compound, consisting of mica, pyroxylin, and camphor, as it passes between the rolls, can be made to assure a very beautiful appearance, the variety of colors, the sparkling reflections of the mica, and the pyroxylin, with its translucent properties, each contributing to the result.

Pyroxylin and Mica

Another method of combining mica with pyroxylin consists in first preparing sheets of collodion pyroxylin, either colored, transparent, or opaque, moistening the surface with a solvent of pyroxylin, and scattering over the surface extremely minute scales of mica, or scales varying in surface, then superimposing another very thin sheet of collodion pyroxylin and subjecting the two sheets to warmth and pressure, so as to form a compound sheet enveloping the mica scales. The superimposed sheet should of course be as transparent as possible, and very thin, in order to obtain the best effects.

Another method is by preparing very thin sheets of mica, cut into any suitable pattern, and inclosing them between two sheets of pyroxylin moistened with a solvent thereof, and then subjecting them to warmth and pressure until complete union occurs between the body sheet and superficial sheet, between which the mica, either perforated or patterned, will be securely retained.

By these and analogous combinations of mica, pyroxylin, coloring matters and inert matters, a very brilliant heterogeneous mass or sheets can be formed, conveying the impression, at a first glance, that fused glass has been welded over the mica and other materials. When mica in masses of two or three

ounces weight has been exposed to an intense red heat, it exfoliates, loses its transparency, and reflects light so as to resemble matt silver.

Imitating Leather

The process of patent 189,338 dated Nov. 27, 1883 has for its object the production of an article which resembles leather having the finish of pebble-goat, French calf, or alligator, and it consists in taking sheets of leather such as are technically called "splits," or those which have been subjected to the splitting process, and applying upon their surface thin sheets of zylonite or a similar pyroxylin substance of a proper color, and which is applied by partially dissolving the surface of the zylonite or its equivalent by any of the well known solvents of such substance, and then subjecting them to pressure, as by a pair of rolls or any gradually progressing compressing surface, so that a split or side of leather, say, three feet wide and six in length, will be under pressure for a period of five minutes, to produce a goat pebble, or a period of a quarter to produce a French calf, or a period of ten or fifteen minutes to produce an alligator surface, by which pressure the leather and the zylonite will be united, and then partially dissolving or applying a solvent, such as collodion, upon the exterior surface of the sheet of zylonite, and progressively passing it between a pair of rolls or compressing surface under a pressure of two hundred pounds, more or less, and moved at a speed of about ten feet per minute (more or less) in contact with a plate of glass or other similar surface, by which the exterior surface of the zylonite will be as finely polished as the surface against which it has been compressed. A convex surface, beginning at the center of the split and gradually extending out to each end in the case of such articles as are formed from sides of leather, will be found to be the preferable method of applying the pressure, owing to the difficulty

FLEXO Joints

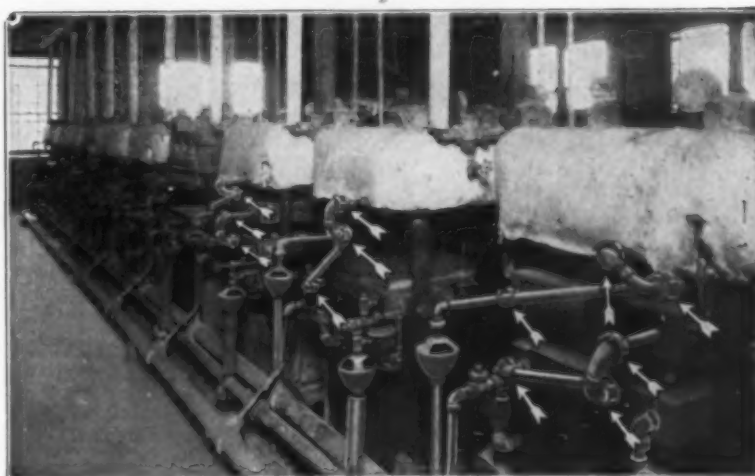
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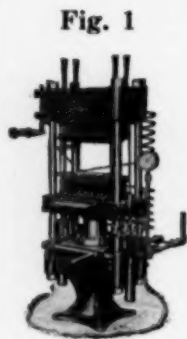
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in forming a whole skin into a plane. In extremely troublesome cases the puckery or wrinkled parts may be placed under tension, as skins are stretched in frames in tanning processes, and, being so held flat, readily combined with the thin zylonite or similar pyroxylin compound. The convex surface to be used in these cases will be an elastic or compressible one, such as rubber or its equivalent. The polishing or glossing of the resulting surface may be effected simultaneously with the combining operation, or before or after it, depending upon the nature of the surface to be operated upon and the degree of polish or gloss required. In some cases a simple treatment with a fluid solvent, removing quickly the surplus, will, with a warm temperature, render a satisfactory gloss. Whatever the result desired, it will be necessary in all cases to so operate as to prevent the solvent used for combining from being in excess or too long in contact with the thin sheet before placing in contact with the leather or base. It is therefore preferable to apply to the solvent gradually or progressively, and then in the same manner almost immediately perform the pressing and combining operation, and thereby simultaneously expelling the surplus solvent.

This review continues with a description of the production of imitation enamels, moire and cloisonne effects and similar products, in our October issue.

Resins and Esters

(Continued from page 506)

temperature of 225° C., and held at this point until the product had reached a sufficient degree of hardness when cold.

When cold the product was a hard extremely tough resin, dark in color, but was compatible with nitrocellulose. Films prepared from a mixture of the resin and nitrocellulose equal parts by means of a butyl acetate alcohol solution were clear and transparent though somewhat dark in color.

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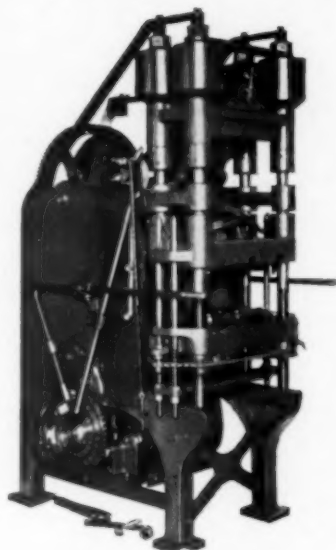
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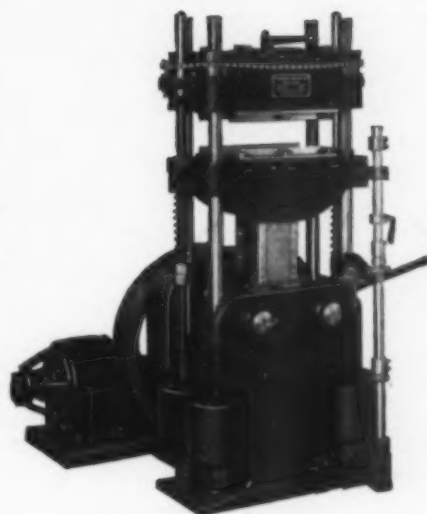
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Vulcanized + Cement

(Continued from page 511)

"While the ingredients may be mixed in different ways. I have produced very satisfactory results by carrying out the process in the following manner:

"The ingredients are all placed at once in a suitable mixer, such as a Banbury mixer, the ingredients being mixed and heated for approximately five minutes, a small amount of water being sometimes added just prior to the close of this mixing operation, about a quart of water being added to approximately 191 lbs. of the mixed ingredients. From the mixer the compound is then run

through an ordinary rubber mill where the ingredients are further mixed and heated. Both in the mixer and in the rubber mill heat is generated by the friction of the rolls, steam, however, being generally supplied to the rolls of the mill to facilitate the mixing, increase the plasticity and assist in driving out the moisture to initiate the heating. The heat which is imparted to the compound in the mixer and in the mill produces the vulcanization of the rubber, the sulphur serving not only to vulcanize the rubber but also to harden the gilsonite and mineral rubber, but nevertheless the compound is plastic.

Molding It

"The compound is taken direct from the mill and placed in molds and molded to produce the final articles without any reheating or further treatment of the compound. The vulcanization of the rubber, while toughening the compound somewhat, does not destroy its plasticity nor does it make it sufficiently hard to prevent the molding of the finished articles when the compound is taken from the mill and placed in the molds.

"Quantities of the compound are removed from the mixer and placed in the mill so as to keep a continuous supply in the mill

The October Issue of Plastics

will contain concluding articles of "Plasticizers, Plastics and Plasticity" by Bary; "Pyroxylin as an Imitative Material" by Rossman, and another installment of "The World's Recent Progress in Synthetic Resins" by Dr. Aladin.



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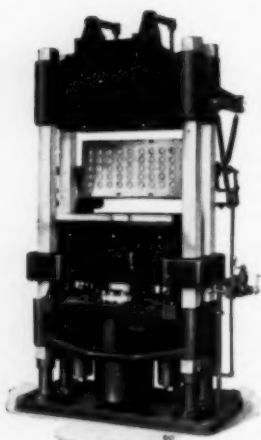
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for immediate use in the molds, the operator taking from the mill definite quantities of the compound and placing the same in the molds which are operated by hydraulic presses, a sufficient number of which are provided to consume the compound continuously passing through the mixer and mill.

The molds of the presses are preferably water-cooled, and after an article has been molded from the hot plastic compound it is allowed to remain in the molds for a brief period, say, two to three minutes, until the molded article has cooled and hardened sufficiently to permit it to be removed from the mold in a finished condition except for the removal of a small amount of flash, and after the article has been allowed to stand for a given time it reaches its permanently hard state by the setting of the cement which is, of course, now thoroughly intermixed throughout the article.

After Curing

"This results in an article or product having the characteristics explained in the early part of the specification, which characteristics are obtained by the use of the proper ingredients in the desired proportions and by the chemical changes which take place before and after the molding operation without, however, requiring special treatments for the particular purpose of bringing about these chemical changes.

"In the rubber mill the ingredients are not only thoroughly mixed together and maintained in a plastic state notwithstanding the vulcanization of the rubber and possible partial setting of the cement, but the compound is uniformly heated throughout. Accordingly it is highly desirable that the compound be taken from the mill direct to the mold without giving the compound an opportunity to cool and without any additional or intermediate heating, for otherwise the plasticity of the compound would be adversely affected. An intermediate heating would tend to heat

the compound more on the surface than on the interior and would result in the formation of a surface crust.

It is a well known fact that cement in itself is not acid proof, but this has no particular disadvantage when my improved compound and process are used in the production of storage battery boxes or other receptacles adapted to contain acid, for at most the acid will attack only the cement which is exposed on the inner surface of the box or receptacle, the cement lying outside of the inner surface being so enclosed or embedded in the ingredients inert to acid that the acid does not penetrate the walls. However, even the attacking of the cement which is exposed on the inner surface can be avoided by the use of suitable substance which will render the cement inert to acid. An ingredient employed advantageously for this purpose is silicate of soda. In the use of this ingredient a suitable quantity is dissolved in water and mixed with the cement which is then supplied to the mixer with the other ingredients heretofore mentioned. When the cement has added to it the water-glass solution mentioned above, it is, of course, not necessary to later add any water to the mixer as is desirable if the water-glass solution is not employed.

It might be added in conclusion that not only does the water-glass render the cement inert to acids but it also adds to the heat resistance of the finished product, materially assisting the cement in this particular function."

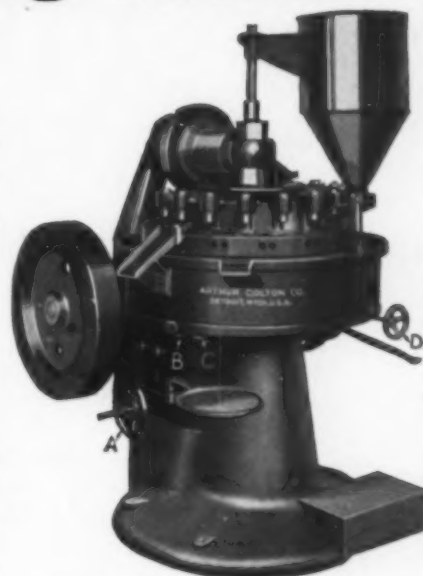
Molded Carbonaceous Material and Process for making same. Harvey N. Gilbert, assignor to the Roessler & Hasslacher Chemical Co., of New York, N. Y. U. S. P. 1,714,165; May 21, 1929.

1. The process of manufacturing a shaped article of an apparent specific gravity over 1.7 consisting in filling a mould with a mixture of comminuted graphitized carbon and a carbonaceous plastic binder, compressing said mixture, and carbonizing the binder while resisting by mechanical means expansion of the formed body, and then continuing the heating to effect further increase in density.

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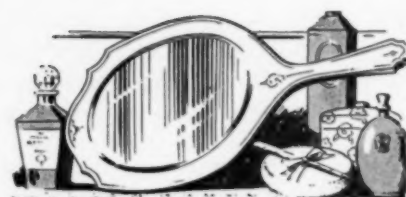
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Room 65
778 Trinity Ave.
Bronx, N. Y.

MOLDED PRODUCTS

Devoted to the purchase, further use and merchandising of all manner of molded parts

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No. 9

What Profits Price Cutting?

A word picture of one of the ills that trouble the Molding Industry which apparently is curable by home methods without the aid of a fancy specialist

by R. C. Gilmore, Jr.

President, *Plastics Publications*

WHAT does an industry—any industry—do when it works to capacity, 24 hours a day, and finds that it isn't making money? What will the molding industry do? Will it adopt the attitude of one of the large eastern molders who said "I'll be damned if I'll be in the molding business another six months!", or will it search out the cause and kill it?

No responsible molder, (or irresponsible one, either) needs to search very far for the cause of lowered profits. Price cutting—that dangerous term!—is almost the entire reason. And yet no molder admits that his organization does business that way. "What! Cut our prices! How can we? We're not making anything on that job anyway. The Glum Electric job? Oh, that was thrown at us. You see Baxter quoted \$34.50 and tried to get it from us. We've had it for years. Well, we went over our figures, and—"

"Went over our figures and"—gave the mold away, or deducted .19 for mechanical overhead or less power cost, or re-quoted f. o. b. buyers office! Is that price cutting or is it fair competition?

We wonder how many molders want the old days back, the real

old days of cut throat business, when every mouth saw some failure and some new incorporation. Well, they're on the way just as sure as Yom Kippur, unless something happens. It's all very well for a group of men to get together and say "Let's be frank; it's the only way we can succeed. What did you quote on the Jewell Safety Razor job, Jack?" Jack, shifty, watching faces, "Don't know. I didn't handle that quotation; anyway I understand Charley got the business at \$7.87 and we can't touch that." Charley, "Seven eighty-seven! Did you see a written confirmation? No! Thought not! No, boys, I'm going to keep that business at \$7.95. I feel it will stabilize the industry". But then the wires buzz. Jack calls the office: "Get after Jewell at \$7.94. What? Mold costs? Forget it. Don't you want the business?" And the chances are that Fred, who doesn't want it, gets it eventually at \$7.87 until Charley takes it away again.

Where Does the Game End

It's a lovely, vicious circle. The molder is to blame as much as the purchasing agent. Originally, to take another example, he may get together with others and decide to amortize mold costs. Fine. But does he? He

gets a quotation in on a big job, something with real profit in it, using new material, and nowhere does mold cost appear. He stands it all, be it \$45. or \$2,000., and his excuse is—"We'll make it up. It's for the good of the industry, and anyway Southern shouldn't have bid against us."

What Blather! And we could go on and say a lot more, specifically, about tube bases, collapsible tube-caps, automobile fittings, radio control knobs and electric parts, but why do it? We'll only eventually offend the over-developed sensitivities of some production manager, who, in turn will go in a huddle with his advertising manager on the radical and unpolitic position of PLASTICS.

We are not trying to offend or hurt anyone. Rather, our one aim is to arrive at a profitable solution of every trouble connected with the industry. Such a solution is independent of any association or Trade-Commission practices, for it is based on the tempered business instinct of every individual. It has been shown time and again that such tactics are not good business—either for dividends or satisfied customers, and it means a slow cheapening of the

distribution market as well as the establishment of purchase competition.

Eventually, of course, the molders will reorganize their methods when their competitors go out of business, but we are not interested in having such failures—we want success. This is prophesied as being a "white collar" year. How much money will the molders have at the end of it? The first six months look well on paper, but present individual quotations can cut those figures in half. Pick out the profitable plant—not necessarily the largest, for some of the small ones make more than the large—and watch its methods. We know you have and that you have said, "Oh, I don't like him. He doesn't do business my way." Of course he doesn't, but is your way right?

The truth of the matter is that price is killing the molding business—or at least certain branches of it. Any purchasing agent is hired principally for his ability to save his company money in its purchases. He (generically speaking) has found the plastic industry a fertile field for the accomplishment of such business acumen. More power to him! One cannot despise a man for accomplishing his purpose! Yet such accomplishment has been due principally to the fact that the molders are unorganized and are suspicious of each other. When lowered value means low or even invisible profit, nobody is ahead. The majority of molding work cannot be done satisfactorily at current prices.

Let's repeat that: *the majority of molding work cannot be done satisfactorily at current prices.* Does that provoke our purchasing agent to some constructive thinking? Or would he rather go ahead, get the job at his price, and then have a suit with the molder over unfulfilled promises on construction? It has happened and is happening even now. Some molders cannot possibly construct a good mold on the specifications, and at the price, given. Consequently the

output is un-uniform or entirely unsuitable.

On the other hand does the above repeated sentence give the molder a thought or two? It should. Unfair price competition has *got* to be killed at the source. We are pretty sick and tired of all the excuses, expostulations and comments on the sanity of the average buyer. He knows his job, and although he knows less than nothing about molding he can, and does, bluff men who know twenty times as much about it.

We suppose the retort is that work is being done satisfactorily at current prices. It isn't. We'll be glad to take, at random, ten jobs from most of the molders plants and prove that a majority of them are unsatisfactory somewhere, somehow. While we're on the subject of dissatisfaction, we wonder how many well known and established molders are dissatisfied to the extent of wanting sale or subsidy or reorganization? Off-hand we can think of six. Al-

(Continued on page 539)



Pepin Package and Product

THAT'S the Tom Houston idea in peanuts. On the Tom Houston Peanut Vending Jar becomes an attractive display. Peanuts must be sold by their display. People see them and want them. Self selling display container is the answer.

The Tom Houston Peanut Company of Columbus, Georgia, solved the problem by an attractive five color lithographed poster which is changed from month to month to keep the attention as well as the freshness of their display before the public. They use an attractive heavy glass jar, mounted on a green and red Durez Base. The

base is attention - getting through its attractive lustrous finish and bright colors. It keeps the jar from skidding or sliding on the counter.

That peanuts have been successfully popularized, is appreciated when you find that one company is vending them in five cent bags to a total of five millions of dollars a year. The molded piece is a big factor in this sales-getting display. It catches the eye and loosens the purse. Molded products have infinite possibilities of application. Perhaps your product is adaptable to molding?

Q. R. S. Kamra Has Beautiful Case Molded in Canvas Base Material

Sales possibilities of new camera for amateur use enhanced by attractive, intricate molded product

AN entirely new type of camera for amateur use has been introduced recently by the Q. R. S.-DeVry Corporation of Chicago and New York. The Still-Kamra is of convenient pocket size and is unusual in having a molded body. The film used is standard motion picture film, but the individual pictures made are just twice the size of the single pictures on motion picture film.

Intricate Parts Are Moldable

Apart from the fact that new features in the photographic mechanism are involved, the case itself is a novel and interesting molding job. The material used is the chopped canvas base molding material, which when molded into a form such as the Still-Kamra, produces an article which is exceptionally strong and at the same time has a very good appearance. At first glance, it appears a fairly close imitation of the natural grain of hardwood, with a glossy finish that would require several coats of varnish or lacquer and much rubbing to produce if that substance were used. Both case and cover are intricately designed, which however did not prove an insurmountable obstacle in the way of the successful molding of the article, despite the bulky nature of the material used. In addition to the molded case, two other molded parts are utilized in the complete assembly, one, the shutter housing, and the other a block on a metallic spring which holds the film strip firmly against the aperture. The Still-Kamra case, cover and assembly parts were molded by Schneider Bros., Inc., of Chicago.

The film is supplied in magazines all ready for placing in the

camera. These magazines contain five feet of film each, which length is sufficient for forty exposures. The camera is probably more simple in operation than any other available.

A small crank is located in



The Q. R. S. Still-Kamra.

the top of the camera body. One complete revolution of this crank in a right-hand direction winds a fresh length of film into position for exposing, at the same time setting the shutter. A very slight backward motion of the same crank releases the shutter and takes the picture. A finder is located near the camera lens, indicating the ex-

act field of view which will be included in the finished picture.

There are no adjustments of any kind to be made in using this camera, as it is entirely automatic. The camera has a very wide range of usefulness. Of course, it is an ideal snapshot camera for children as well as for adults. When on a vacation, the large capacity of the camera is a decided advantage as it renders unnecessary frequent reloading. Industrial concerns are equipping their salesmen and other representatives with this camera, and automobile clubs are advising their members to carry one at all times in their car not only as a source of pleasure but also to permit the establishment of incontrovertible evidence in case of accident. In fact, there are few photographic purposes which the camera will not serve admirably.

Low Cost and Quantity Production Combined

Another feature of the camera is the great variety of forms in which the final result may be obtained. Paper prints the same size of the original may be made individually or in long strips. Such prints may be made upon positive film and projected just as lantern slides are projected. The manufacturers of the camera also make a small projector for this purpose, which also is to be made with a molded case.

The low cost, durability, novel and attractive finish, large capacity, low operating cost and fine results obtained combine to make this one of the most popular cameras of the year, and towards the making of which the molded case contributed no little.

Synthetic Resins in Dentistry

No one material combines all the required properties but the art of molding suitable dentures is developing

By Chas. H. Prange, M. E.

Vice-Pres. Austenal Laboratories, Inc.

THE purpose of this paper is to attempt to point out the opportunities and needs for the use of synthetic resins in the construction of dental restorations, commonly called "false teeth", to point out the chief qualifications which such a resin should possess in order to be successful, and to present the background of this field of work in order that the subject may be better understood. It is also necessary to point out the fundamental differences which exist between this class of work and the usual applications of synthetic resins.

It may not be realized by some that the construction of dental restorations is an extremely important industry. The "full" upper or lower artificial denture is what we usually visualize when we think of this kind of appliance and although these are made in large quantities there are very many more "partial" dentures made. The total of all of these classes of restorations represents a very large number. It may be informative to state that there are approximately 70,000 dentists in the United States.

Esthetic Plates Are Rather Recent Developments

In looking back over the history of dentistry two facts stand out; first, that efficient and esthetic dental restorations are a recent development, most of the progress having been made within a comparatively short time and second, that this progress has very largely been determined by the limitations of available materials. This last thought is illustrated by reviewing the materials that have been used.

The idea of making dental restorations is a very ancient one, the art having been practiced by the Egyptians, Phoenicians and other peoples. The materials used were bone, ivory, hippopotamus tusks, metals, etc., and the methods used were those of hand craftsmanship. Even as late as George Washington's time dentures were laboriously carved by hand from ivory;



A practical dental plate molded out of translucent Bakelite.

they were expensive and their crudeness and lack of fit is shown by the fact that metal springs were used to keep them in place in the mouth.

The next important step was from hand carving to molding, the latter method of forming dental restorations being made possible by the discovery of vulcanized rubber and celluloid. Celluloid after use for a short time lost its popularity due to the fact that it gave off a disagreeable taste of camphor and also did not retain its shape. Vulcanized rubber, though its introduction into the dental field was retarded for a time by patent litigation, soon came into very wide use. It would be difficult to overestimate what this has meant in dentistry for "vulcanite", as it is usually termed, has many outstanding advan-

tages and remains to this day the most practical and reliable non-metallic material for denture construction.

Moldable Materials Produce Accurately Fitting Plates

To summarize, the invention of suitable moldable materials changed the processes of denture construction from uncertain crude hand craftsmanship, or cut and try methods, to skillfully developed techniques, certain in their results, and immeasurably more accurate.

The other materials in general use at present include gold and platinum alloys, stainless steel, porcelain, synthetic resins and lately certain cellulose compounds. Dentures may be all vulcanite with porcelain teeth, all metal with porcelain teeth, or composite constructions consisting of metal and vulcanite with porcelain teeth. By far the largest number of dentures produced at present are made entirely of vulcanite except for the teeth which are of porcelain.

Vulcanite has the advantages of cheapness, easy manipulation and durability—it is not uncommon for dentures to be in use for 20 years. Vulcanite is capable of coloration to imitate the natural tissues, and finally has one outstanding advantage in that it is capable of reproducing with utmost fidelity every minute detail of the dentist's impression. On the other hand, it has some very serious disadvantages chiefly from the patient's point of view. They are first, unesthetic, even the best of pink dental rubber is conspicuous by its unnatural appearance, its flatness and total

lack of translucency. Second, it is unsanitary as rubber very quickly accumulates a slimy and adherent coating in the mouth which is very difficult to remove; it also retains odors and tastes as of tobacco and food, and has a more or less porous surface which supplies a lodging place for food and bacteria. Third, although fairly strong, it is subject to breakage from strains of mastication or from being dropped and for this reason it is necessary to make vulcanite dentures rather bulky to increase their strength. Fourth, vulcanite has very poor heat transmission qualities which causes an unnatural feeling to the wearer. It is not strange therefore that earnest attempts are being made to find a substitute for vulcanite.

Molds Used Once Only

In considering the use of synthetic resins for dental purposes, it is well to point out first of all that this application is the direct opposite of quantity production. No two dentures were ever exactly alike any more than two faces or thumbprints. The human mouth varies in size, shape and character to a remarkable degree. At the same time, the work of constructing a denture requires utmost accuracy.

Such a condition naturally suggests moulding or casting processes of construction, but of course this must be done without the use of permanent

moulds. In the moulding of vulcanite or synthetic resin dentures, plaster of Paris is usually employed for making the mould. The process is briefly as follows: The denture is first made up in wax according to the dentist's impression of the mouth, the porcelain teeth being set in the wax. After trying in the patient's mouth to make sure that all the relations are correct, the wax case is imbedded in plaster of Paris using a dental flask which is made in two halves giving the effect of a split mould. After the setting of the plaster, the two halves are separated, the wax is removed with hot water and the teeth remain held in the plaster in their correct position in the one half of the mould. The moulding material is then placed in position, heat applied to soften it, and the two halves are then pressed together, the excess material being squeezed out between them. Naturally only limited moulding pressures may be employed in order that the plaster may not be deformed and the teeth displaced.

The synthetic resins offer a promising field for the development of a substitute for vulcanite and the following will give the specifications of what might be considered an ideal material.

1. Esthetics — The resin should be light colored, preferably water white, so that it may be colored to simulate the bright pink, the depth and translucency

of the healthy tissue. All black or dark colored resins are ruled out because it is necessary to load them up with pigments to overcome the dark color and they then become opaque and flat.

2. Sanitation — The resin should be dense, non-porous, non-absorptive, and should be capable of receiving and retaining a high polish. The surface should be glassy smooth so that deposits will not adhere.

3. Comfort — It should have good heat conductivity, lightness of weight, strength without thickness, should be non-irritating to the tissues and should not cause a taste or odor.

4. Durability — A denture is expected to give service for years, therefore the resin should not be dissolved or affected by the mouth fluids; it should not be hygroscopic nor release irritating agents, which would be taken up by the saliva. It should not warp, swell nor change its shape. It should strongly adhere to porcelain teeth and clasps which are embedded in it, and should not separate or shrink away from these thus leaving a crevice. It should be strong, for the muscles of the jaw are very powerful and severe stresses are created in the denture. It should be shock-resistant so as not to fracture from being dropped and should also be resistant to abrasion so

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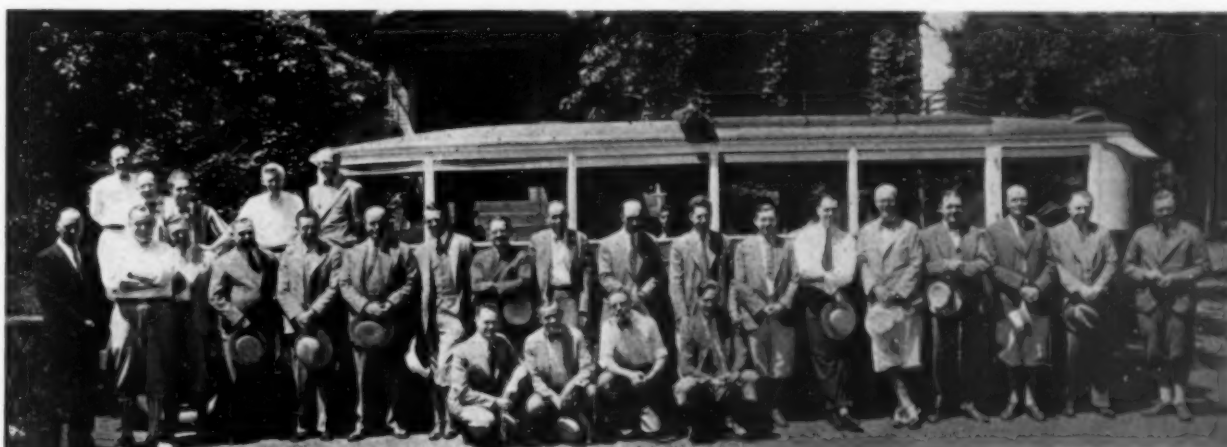


Photo Courtesy Mr. J. P. Rossiter, Reynolds Spring Co.

Members and Guests, Nema Molded Insulation Section Meeting, Jackson, Mich., July 16th, 1929.



Amerith, Inc., Has Modern Toiletware Showroom

New Company is subsidiary of Celluloid Corp. to handle Fancy Goods.

CELLULOID Corporation has just announced the formation of a subsidiary company, Amerith, Incorporated, which will handle the sales and distribution of the toiletware and novelty business formerly conducted by its Fancy Goods Division. This is in keeping with the progressive spirit which marks the Celluloid Corporation.

Toiletware has its place in the well appointed home. In this day of color appeal, color harmony, in this day when the trend of fashion expresses itself in all the accessories of the home, plastic compositions lend themselves most readily to the spirit of the times. Amerith, Incorporated recognizes the need for merchandising this product on a higher plane, and coincident with its formal announcement to the trade, has moved to a new and modern show room at 10 East 40th Street, New York City.

The Amerith show room is distinctly modern in its treatment and decoration, but is not extreme in any respect. The silver tinted walls, the soft

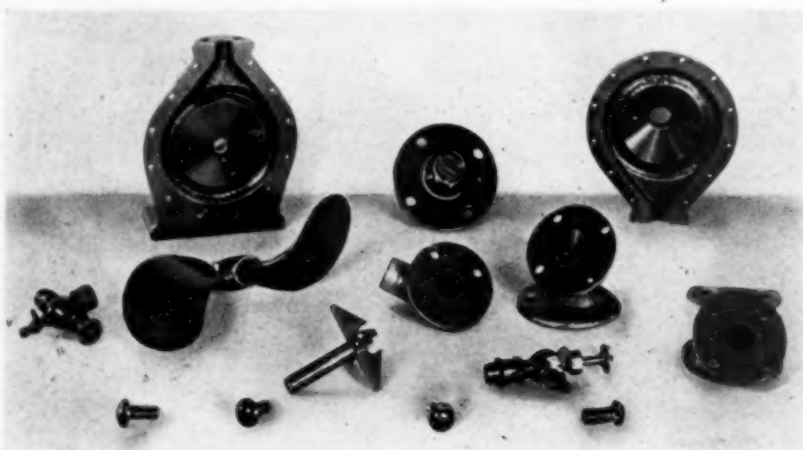
green drapes, the delicate colors of the many sets, all convey an impression of perfect color harmony. Lanterns of pewter, with Celestialite globes, give a light which is almost ideal for gauging true color values. Along the main part of the show room are display booths, also tinted in silver. In each booth is a dresser, mirror and accessories to simulate a corner of a bedroom. Displayed on the dressers are sets of Amerith toilet-

ware, the rugs, drapes, lamps and other fixtures all harmonizing with each set. Distinctly decorated, the sets may be reminiscent of old colonial times or may be quite modern in feeling and design. These exhibits are designed to aid department stores in displaying and selling their merchandise. Interior decorators will also find in them many valuable ideas.

One has but to recall the vogue for ivory and shell toiletware, with its drab and prosy appearance, to measure the present contribution of the chemist and the colorist to the home and the dressing room through modern pyroxylin plastics, with their appealing configuration and color effect.

New Stylist Engaged

As a part of its aggressive program, Amerith, Incorporated is conducting extensive studies into the problems of merchandising. June Dunham, a stylist and authority on Household Economics has been added to the staff, to advise on all matters pertaining to color trends, style, design, packaging, and merchandising. The officers of Amerith, Incorporated include J. A. Stephens, President, S. E. Palmer, Executive Vice President, W. M. Buttrick, Vice President in charge of sales. Amerith, Incorporated, is keeping open house and has sent out special announcements to the trade, naming the week of September 9th as a time when the trade will be welcome to the new headquarters.



These parts, constituting an impeller used in the manufacture of toothpaste, are coated with Bakelite varnish, to provide corrosion resistance. The toothpaste mix is slightly acetic, and when uncoated metal was used a metallic contamination problem was introduced.

The Design of Molded Products

A study of the bearing that methods of manufacture and the characteristics of the finished piece have on the efficient design of molded articles

by *W. F. Lent*

Assistant Superintendent, Cutler Hammer, Inc.

THE design of molded products is a subject of interest to both manufacturers and users of such products, meaning by user essentially the manufacturer or distributor who comes to the molder with molding requirements. When efficient design is understood by the user his requirements initiate along correct principles, and considerable time and expense involved in altering an inefficient design are saved.

It may be said at the outset that the design of molded products is not an exact science. This is due to physical limitations in molding materials and in mold structures. Also, it is due to lack of exact knowledge of plastic flow in commercial design of parts. In many cases designs are controlled by educated judgement or comparison with previous successes and failures. It is evident, therefore, that complicated and difficult shapes require great experience and a back ground of accurate records of past production. Even then the efficient designer must have courage and initiative to attempt new and difficult designs, and improvements in methods. He must have power to visualize proposed constructions in their effects on production and manufacturing methods. Unfortunately any cut and try methods are most always precluded on account of the expense of mold changes, particularly with multiple cavity molds.

However, out of all this mystery and uncertainty come very definite and clear cut principles adaptable to both cold and hot molding. (1) These will be

evident by an examination of the analysis given in outline form herewith. Design must practically always effect a compromise between conflicting requirements which may be outlined as follows.

1. Requirements of the Application.

A—MECHANICAL

- a. Strength
- b. Accuracy
- c. Heat resistance
- d. Resistance to solvents and chemicals

e. Finish

f. Inserts

g. Miscellaneous special.

B—ELECTRICAL.

- a. Voltage
- b. Creeping surface

c. Puncture voltage

d. Other electrical constants.

2—Requirements of Efficient Manufacture.

A—PRESSING AND DIE DESIGN.

- a. Flow
- b. Draft and clearance
- c. Fillets and radii
- d. Location of inserts
- e. Location of holes
- f. Forms to avoid

B—MACHINING OPERATIONS.

- a. Drilling
- b. Broaching
- c. Turning

C—CURING.

- a. Warping
- b. Blistering

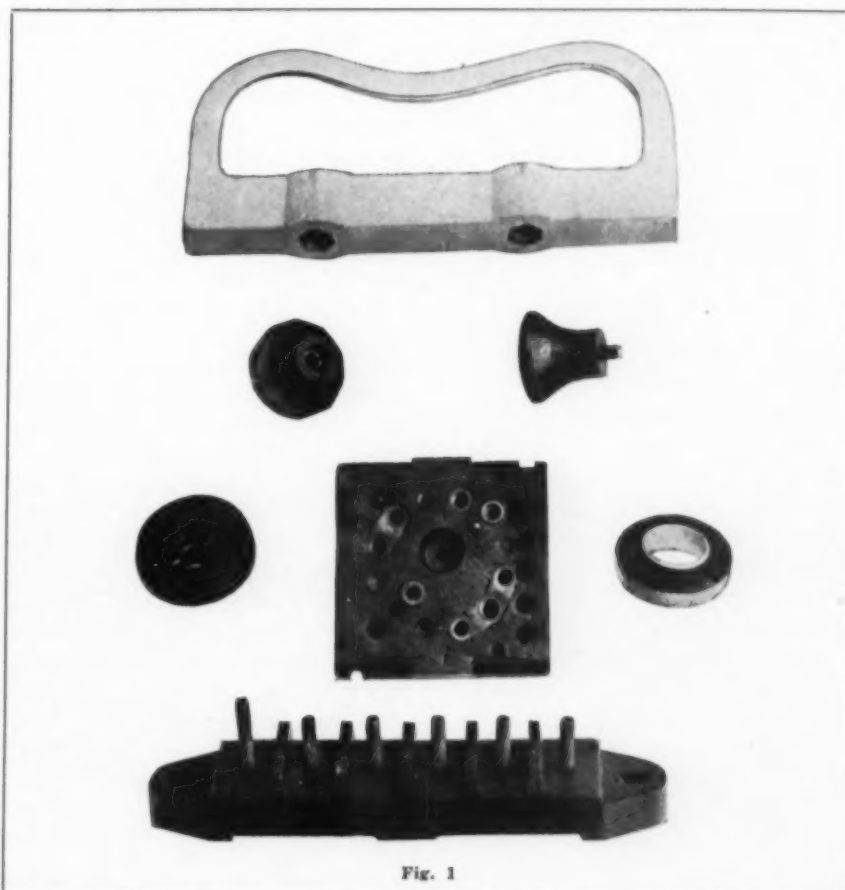


Fig. 1

(1) See "Cold Molding Has Advantages" by W. F. Lent, *Plastics*, April, 1926. "Hot Molding vs. Cold Molding" by W. F. Lent, *Plastics*, Sept., 1927.

D—FINISHING.

- a. Knurls, stipples, and flutings
- b. Polishing
- c. Scratch brushing
- d. Lacquering
- e. Tumbling

In an article of this scope it is possible to discuss this outline in but the briefest manner. This we will do with reference symbols, the same as in the outline.

1. A—(a) Strength.

The prime requirement of any design must be mechanical strength because if this characteristic is lacking the part cannot fulfill the functions for which it is intended. A wide range of strength of molding materials is available, ranging in transverse strengths from 3000 to 8000# per square inch for cold molded material, and 8000 to 12000# per square inch for hot molded materials. While these specific figures for each material are useful it is seldom necessary to calculate strengths as other conditions generally influence sizes and sufficient strength may be obtained by comparison with other parts on which actual use has demonstrated sufficient strength.

1. A—(b) Accuracy.

Accuracy of the dimensions of a part is tied up with the question of the tolerances allowable on the specified dimensions. The necessity for a tolerance on dimensions is not an admission of weakness, but is a well understood requirement of duplicate parts manufacture. Within limits, the greater the tolerance allowable, the less the cost involved in manufacture, and the less the rejections due to variations in size. Unquestionably there is a decided tendency

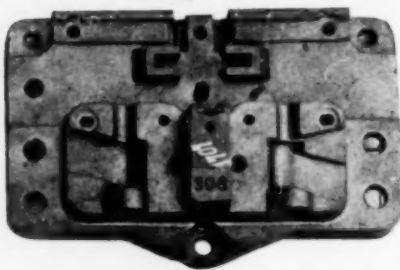


Fig. 2

toward the specification of unnecessarily close tolerances. When the user is made to understand that liberality regarding tolerances results in a lower cost to him, and, a smoother flow of shipments, the troubles are generally minimized.

In general it may be said that cold molded parts may be produced within a tolerance of plus or minus .005 per inch, and hot molded to plus or minus .002 per inch, although these figures will vary considerably with the type of design. Pressing thickness with the positive type of dies, as used in cold molding, generally requires a tolerance of plus or minus .010 overall.

1. A—(c) Heat Resistance.

The following rough figures may be of general use. Cold molded organic materials have a heat resistance of from 400 to 500°F; inorganic cold molded materials up to 1000°F; phenolic hot molded materials from 300 to 400°F; Shellac and celluloid compounds generally soften under the boiling point of water.

1. A—(d) Resistance to Solvents and Chemicals.

Cold molded organic materials are commercially water proof. Cold molded inorganic materials are moisture proof but will not maintain dielectric strength on immersion in water. Most hot molded materials are quite water proof.

1. A—(e) Finish.

High grade cold molded products come from the mold with a good finish. They may be polished to a high luster if desired. Hot molded materials rarely require polishing and come from the mold with a good luster.

1. A—(f) Inserts.

Metallic inserts of various shapes may be molded in both hot and cold molded parts.*

1. B—Electrical Requirements.

In general cold molded materials are suitable only for use on voltages below 600. Phenolic hot molded materials may be used on high voltage. For example note the universally used distributor cap for the high tension spark on automobiles. An

*See "How to Design Inserts" by W. F. Lent, *Plastics*, February, 1928.

example of provision for creeping surface on a part for electrical use is seen in figure No. 1 in the terminal board at the bottom of the group.



Fig. 3

2. A—(a) Flow.

It is the flow characteristic of the particular material selected which greatly influences the possibilities of a particular design. The more plastic the material the easier the intricate shapes and thin sections may be formed. Obviously hot molding allows greater range than cold molding in this respect, although cold molding gives considerable latitude. For example see figure #2 showing a thermal overload base with intricate deep sections made of cold molded material.

2. A—(b) Draft and Clearance.

Draft and clearance of parts of the mold is provided to allow ready ejection of the pieces from the mold. The usual figure used is 2 degrees for cold molded designs and 1/2 degree for hot molded.

2. A—(c) Fillets and Radii.

Fillets and radii facilitate flow, strengthen the parts, and prevent the liability of chipping of the edges. An example is shown in figure #3 where the depressions for terminal studs are well filleted.

2. A—(d, e,) Location of Inserts and Holes.

The preferred location of inserts and holes in molds is with the axis in the same direction as pressing. This obviously produces the cheapest construction, as complicated die structures are not necessary in order to remove the pins before ejecting the parts from the mold. Other designs are, of course, possible. See figure #1, arc shield, at the top

(Continued on page 538)

WHAT'S IN A NAME?

By *Carl Marx*

Editor of Plastics

IN the recent contest to pick out a new name for resinoids, the winning word was "Resoid."

A very short search in the United States patent office reveals no such word as actually registered as a trademark. However similar words are very numerous, and in view of the long time that the terms **Resinoid**, **Resol**, **Resinite** and **Resite** have been used, the new word "Resoid" is hardly freighted down with novelty.

Just a little parade of names using the prefix "Res":—

Resiston Hard rubber insulation

Reso Dandruff remover

Resola Beverage

Resolit Rubber composition

Resona Phonograph

Resphan Reso Products Co.

Resopon Reso Products Co.

Resilio 5 different marks including rubber heels, cravats, chairs, etc.

Resinol 3 marks (medicinal)

Resinous medicinal

Resistoil rubber hose

Resistol a large number of them.

Rezone Ellis Foster Co. synthetic resin.

The ending "oid" forms part of literally hundreds of marks and commercially used names such as Celluloid, Fiberloid, Rubberoid, Amberoid, etc.

Now a little about the psychology of the idea. What does "Res-oid" impart to the uninformed? Does the man on the street get any distinct idea of what the material is or will do? Most folks will think of **resistance** and hardly at all of resin, as that word is purely technical. The pronunciation also will give trouble, for is it **Re-soid** or **Reesoid**? (i. e. long or short e?)

Another criticism is that the word does not describe a product "hardenable by heat" as the terms of the contest suggested.

We believe that a better word can be found and welcome suggestions. We are not offering a prize—for it seems that does not produce the results as those best fitted to coin a really good word are usually the type that would not enter **any** kind of a contest.

G. E. FORMS NEW WHOLESALE UNIT

EFFECTIVE October 1, 1929 the fourteen wholesale distributing corporations owned by the General Electric Company will be consolidated into the General Electric Supply Corporation (of Delaware.) These companies have for many years distributed General Electric products and the plan involves no change of ownership. The consolidated corporation will be in a much better position to offer nation-wide service through its ability to give service from any one of seventy-six houses, through interchangeability of stocks, and speedier and more economical operation.

The tentative organization plans indicate corporate officers as follows:

Gerard Swope, Chairman of Board

C. E. Patterson, President and Director

J. L. Buchanan, Executive Vice President and Director

L. R. Link, Secretary-Treasurer

L. M. Nichols, Comptroller

The department heads, district managers and other officers will be announced when appointed at October 1st.

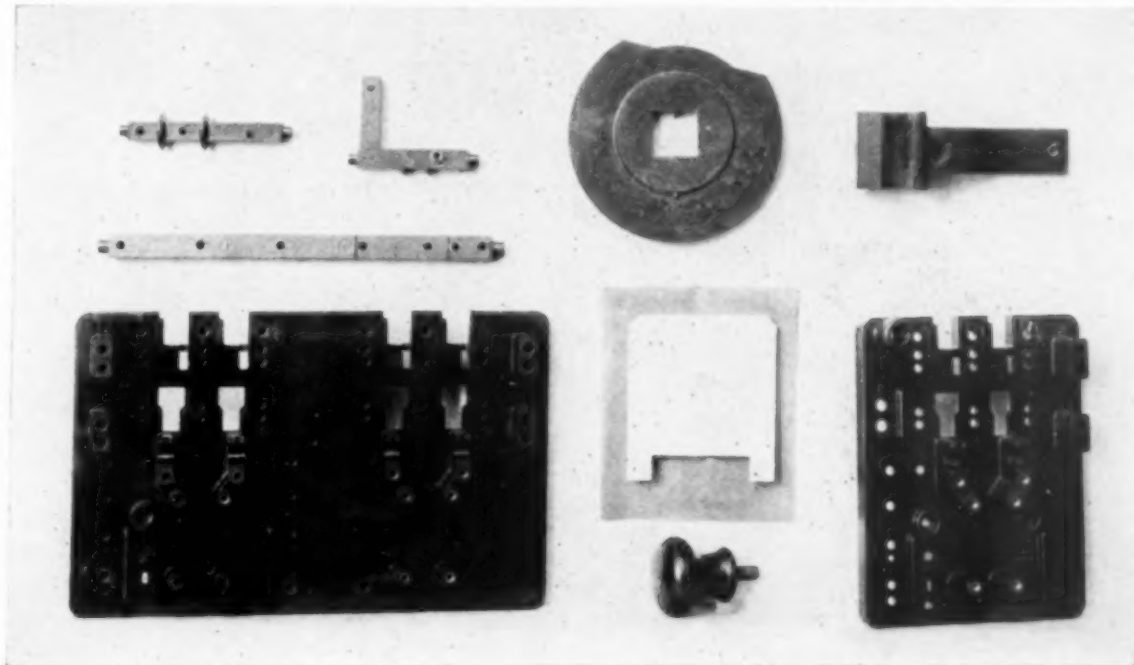


Photo Courtesy General Electric Co.

Molded Textolite Parts for Industrial Control Apparatus

NEWS of the INDUSTRY

MANCHESTER EXPANDS

THE Manchester Manufacturing Co., of Manchester, Vt., custom molders, have acquired the Air-King Products Co., of Brooklyn, N. Y., which will act as the designing and merchandising unit of the new organization. Office and warehouse will be located at 216 Wallabout Street, Brooklyn, N. Y.

BERNHARD IN EUROPE

MR. Adam Bernhard, American representative of the Rhenish Rubber and Celluloid Co., is abroad on his annual visit to plant and offices of his principals in Mannheim, Germany.

Scranton Button in Merger

THE Scranton Button Company is the leading spirit in an \$8,000,000 phonograph record combine which includes Cameo

Record Corp. and the Regal Record Co., both of New York. When plans are completed, the new company will be manufacturing 75 per cent of the records produced in this country. No new financing is contemplated. The Cameo and Regal companies will hire the artists and make the recordings as heretofore, and Scranton Button Co. will manufacture the records.

Leominster Receives Athletic Field from B. W. Doyle

BERNARD W. DOYLE, Vice-President of the du Pont Viscoloid Co., and Mayor of Leominster, Mass., has just presented to his city a parcel of land, together with the necessary equipment, for a modern athletic field. Mr. Doyle has for many years fostered athletic projects in the schools of Leominster.

T. E. Webster Joins Investment House

T. Elwood Webster, formerly vice-president of the Celoron Company, subsidiary of Diamond State Fibre Co., is now associated with Cassatt & Co., investment bankers.

Cassatt & Co., established in 1872, are members of the New York and Philadelphia Stock Exchanges and are underwriters and distributors of investment securities.

Mr. Webster will continue his contact in the industrial fields, as he is primarily interested in developing and acquiring new financing.

Laminated Safety-glass Manufactured in Japan

A special laminated safety glass composed of two sheets of glass with a thin sheet of celluloid is now being manufactured in Japan, the Department of Commerce was advised.

The Department's statement follows in full text:

Glass used in the manufacture of this product is imported either from the United States or Czechoslovakia, while the celluloid is a Japanese product.

The patent is owned by the Minister of the Army, and the product is approved for Army and Navy use. At the present time this glass is produced in only one specification, i. e., 5 mm. in thickness, 24 inches in width and 48 inches in length. The product of this factory is sold at four yen per square foot ex. factory (the yen is \$0.485). The productive capacity of the present plant is 200 pieces of the above dimensions each month.

The very best quality of thin plate glass, of American manufacture, is being used in the manufacture of this laminated safety glass. Plans are going forward for the manufacture of thin plate glass in one of the Japanese glass factories.

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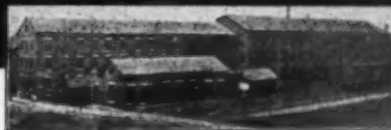


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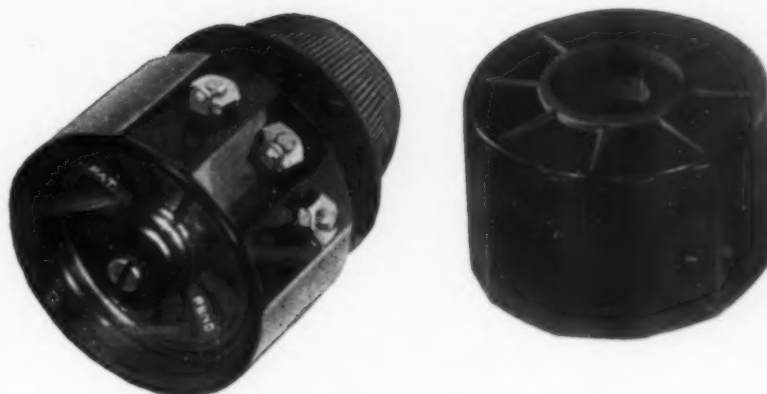
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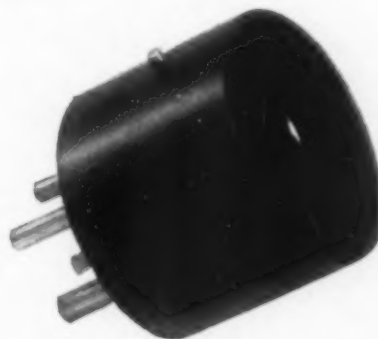
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Market for Pyroxylin Scrap in Germany

A demand exists in Germany for "celluloid" or pyroxylin scrap and is said to be increasing gradually. As the German production of "celluloid" scrap is insufficient to supply the demand, Germany imports considerable quantities from various adjacent European countries, as well as a certain amount from overseas.

Such scrap is imported into Germany principally from the United States, Great Britain, Czechoslovakia, and Poland. The following table shows the Ger-

man imports and exports of this material from 1926 through the first four months of 1929.

	Imports	
	Metric tons	Marks
1926	370	111,000
1927	771	525,000
1928	814	781,000
1929 (4 mos.)	216	220,000
	Exports	
	Metric tons	Marks
1926	598	695,000
1927	365	347,000
1928	588	556,000
1929 (4 mos.)	219	185,000

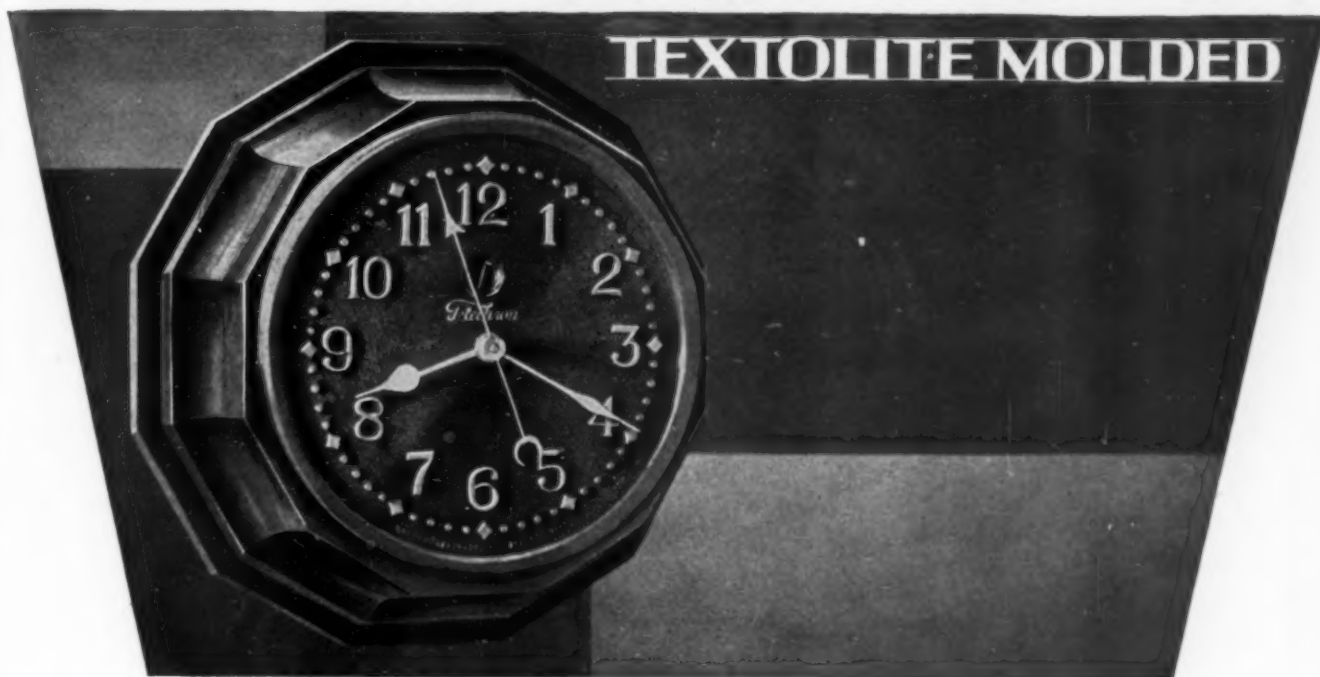
Little can be said with regard to local preferences in this product, although price seems to be the principal factor in this market. The high overseas freight rate charged for pyroxylin plas-

tic scrap, due to its inflammability, makes it essential that American firms sell at a very low rate in order to compete in this market.

duPont Wood Flour Plant Burns

FIRE resulting from an explosion caused damage estimated at \$2,500 in the Newhall, Me. plant of E. I. duPont de Nemours & Co. The mill, employing about forty men in the manufacture of wood flour used as a base for dynamite, were idle for a week while repairs were made.

MOLDED BY GENERAL ELECTRIC



AS modern as the Telechron itself is this attractive Textolite molded clock case, molded by General Electric for the Warren Telechron Company. The case, with raised numerals, is fabricated in one piece, coming direct from the molds with its rich walnut finish that will never require polishing or refinishing. It is an excellent example of the molder's art. ¶ In this Telechron case—and in all Textolite molded products—are incorporated all the experience and technique acquired by General Electric in producing half a billion moldings. ¶ Thus Textolite molded, attractive, durable, dielectric, combining General Electric's unexcelled facilities for research and for production, gives *complete* satisfaction to all users of molded parts.



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CHILEAN MARKET FOR CELLULOID

In order to encourage the manufacture of articles from celluloid, the Tariff enacted in February, 1928 increased duties on manufacture of this article but reduced those applying against celluloid in sheets. As a result, there has been a steady increase in the manufacture of such articles locally, and this has increased somewhat the demand for celluloid in sheets, practically all of which is supplied by Europe.

PERU REDUCES IMPORT DUTY ON "GALATITE" FOR INDUSTRIAL PURPOSES

"Galatite" for the manufacture of combs when imported in quantities exceeding 500 kilos for manufacturing purposes will be dutiable at 10 per cent ad valorem under Rule 46 of the Peruvian Tariff by a resolution of April 4, published and effective April 30, 1929. "Galatite" is not specifically mentioned in the Peruvian Tariff but by analogy it is dutiable as synthetic rubber under item 1236 of the Peruvian Tariff at 0.50 sol per gross kilo (1 sol—approximately \$0.40 U. S. currency) current exchange when imported in quantities smaller than 500 kilos.

New Publication on Micarta Gears

"Micarta, Silent Gears and Pinions" is the title of a new 20-page booklet, number C-1579-F, released by the Westinghouse Electric & Manufacturing Company. This circular gives a complete account of the Westinghouse Micarta gear material; its history, as well as the design, application, and distinctive features of micarta gears. Descriptions of and photographs of various types of installations of these gears make the booklet interesting and educating.

Such data as is necessary to engineers for applying Micarta gears to all classes of work are completely presented with drawings to illustrate a fair representation of standard construc-

tion, which has been recommended and generally adopted for gear and pinion construction. This publication is of particular interest to such concerns as fabricate gears of various designs and applications. The formulas and tables are based on the recommended practice of the American Gear Manufacturers Association, adopted at the

This circular will be sent upon request from the nearest district office or from the Micarta and Insulation Section at the East Pittsburgh, Pa. works.

Italian Plastics Industry

THE only plant in Italy engaged in the manufacture of "celluloid" is that of the Societa Italiana della Celluloide at Castiglione Olona with a daily capacity of about 4,000 kilos, at present running around 60 per cent capacity. Approximately 75 per cent of the products are sold to Italian specialty manufacturers, the remainder going into export trade.

"His Master's Voice" Comes of Age in Britain

A reception was given by the Gramophone Company (the English Victor Talking Machine Co.) in the auditorium of its factory at Hayes, near London, on the occasion of the twenty-first anniversary of the first pressing of "His Master's Voice" records for sale to the English public. The foundation-stone of the factory was laid by Dame Nellie Melba in 1907.

The factory's output of records during the last 21 years, said Alfred Clark, the managing director, would take 1,081 years to play straight through without allowing for the time taken to change records or needles.

Sir Landon Ronald, the famous conductor, speaking of his thirty-two years of association with the company, recalled the days when the public disliked phonographs, and well-known artists refused to make records. On one occasion he induced Ben Davies, the great tenor, to sing six songs for the phonograph after much persuasion. He had



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assured Davies that he would be paid his concert fee of 40 guineas (\$210) for his services. This news came as a rude shock to the company, which had never dreamed of such "magnificent" sums, and thought that two guineas (\$10.50) and a phonograph would be sufficient remuneration for Davies. The sum demanded was, however, paid and Ben Davies's records proved a cheap investment.

The company's great factory at Hayes at present covers an area of 58 acres. Land has also been acquired for further extensions, which, when realized, will make a total of 75 acres of buildings. The output of the factory, which now employs 8,000 hands, was in 1908 about some 700 records per week. Now it is nearly 500,000.

Merrick Elected Westinghouse President

F. A. MERRICK, an executive well-known within the electrical industry was elected President of the Westinghouse Electric and Manufacturing Company by the Board of Directors of the Company, meeting in New York City.

In announcing the election of Mr Merrick, A. W. Robert—the Board of Directors, accepted the resignation of E. M. Herr, President since 1911.

Design of Molded Products

(Continued from page 530)

of the group where the inserts have been molded at right angles to the line of pressure.

Care must be exercised, particularly with small holes and inserts, in location near points of heavy flow. This is an account of the limitation of strength of small pins in the mold.

2. A—(f) Forms to Avoid.

Most molders have issued to their designing departments examples illustrative of some typical errors in moldings with the corresponding correct forms. It is impossible to go into details on these matters with the space that we have here.

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2. B. Machining Operations.

Machining operations may be reckoned with in various forms. Often it is cheaper to perform some small operation on the parts rather than go to complicated mold structures. Figure #4 illustrates an attachment plug base made in very large quantities on which a groove is turned after molding to hold on the screw shell. This illustrates a cold molded part on which a machining operation is performed before the part is cured.



Fig. 4

2. C. Curing.

The action of the molding material on curing must always be taken into account. An inefficient design will show up blistering and warping if the sections of the designs are too thin.

2. D. Finishing.

See 1.—A—(e) above. In many cases pleasing designs may be obtained without finishing operations by relieving the surface with knurling, stippling, or other design work.

Lest the above discussion prove too imposing for average use, it may be said that many simple designs go through the average molding plant as a matter of course and with no trouble. On the other hand, some designs which may appear simple to the uninitiated deserve the most careful scrutiny and analysis.

What Profits Price Cutting

(Continued from page 524)

most 8% of the domestic industry! That is much too large a figure, and yet not a surprising one.

All the foregoing seems to paint rather a black figure, but there is reason to hope that it is transient. More men seem to be awakening to the truth that each individual job must pay

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We would be glad to have you send us samples of molded parts for our inspection without obligation, and tell us what you have accomplished for some of America's leading manufacturers.

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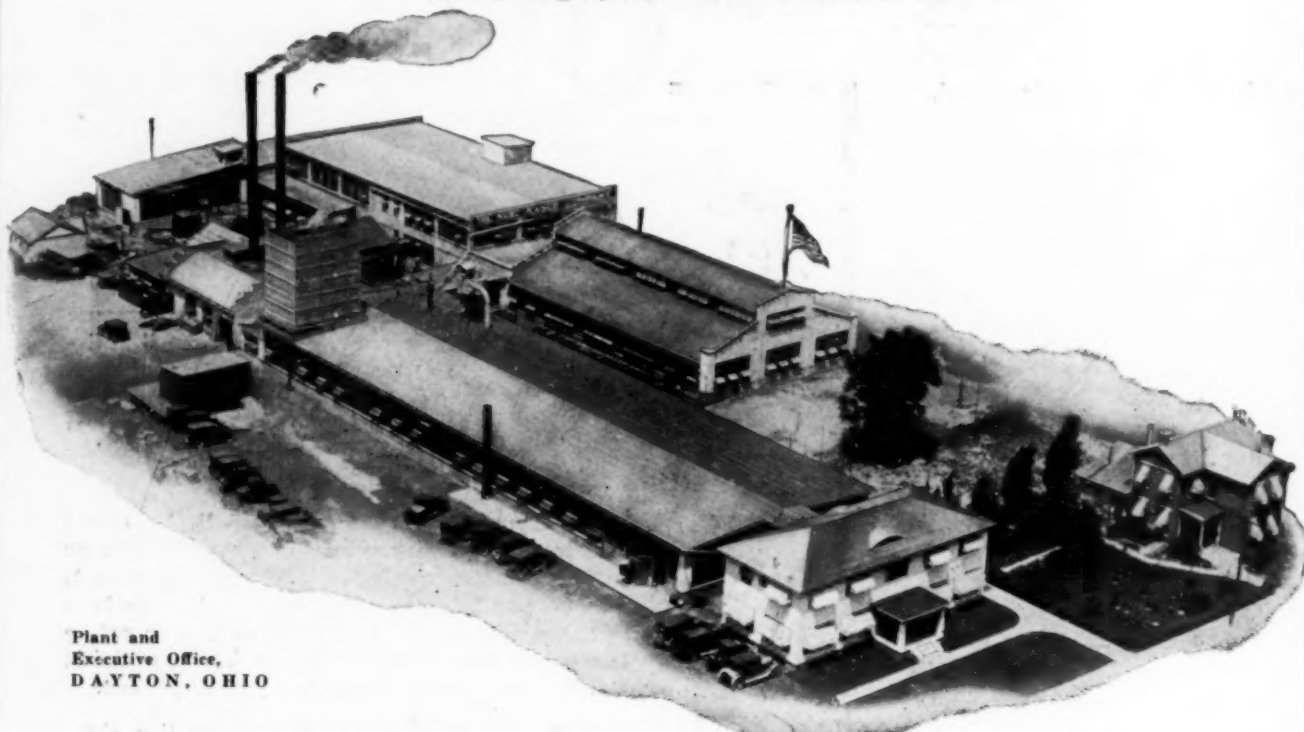
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for itself and make a profit. Conditions, on the whole, are better than those a year ago, but they need further improvement.; Some of the smaller plants are doing good profitable business and will grow larger during the year. Some will pass out of the picture.; Consolidations are certain to occur very shortly, adding to the strength of the industry. New codes will take the place of old and profits will rise the country over. But it all depends on one supposition: that every salesman, every contract man, can take and lose business ethically, getting one

jump ahead of the purchaser. Current market prices undoubtedly favor the cut price estimate, but current prices are too low and must be raised.

One last word. The taint of unethical business often clings to a man who has forsaken it. Unjust, but true. Even if he is now ethical, others are apt to mistrust and point to him first, crying "Judas". Those within the organized branches of the industry must be the very first to awaken to the responsibility of stabilization that is ahead. Otherwise there will be no increase, either in the organiza-

tions or in the value of business. Every molder should be interested in keeping not only his business, but his competitors, out of the red.

Synthetic Resins In Dentistry

(Continued from page 527)

that the smooth surface will not be impaired. Finally, the color should be permanent, it should not fade, darken nor change to another color.

5. Practicability—The technique of handling should be simple and certain as it is with vulcanite, and the product must be accurate. It is important that

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the time required for curing of the resin after the denture has been moulded should be short for almost all dentures are made in a hurry. There should be either not any, or very little, volume change during curing otherwise accuracy will be impaired. In case of breakage it should be possible by simple process to repair the denture without entirely making it over. Finally, the material should be stable and should not readily change its state when kept in storage before using.

It will be observed that to find an ideal resin for dental

purposes is by no means an easy task and it may be predicted that any solution will be in the nature of a compromise. There has been a great deal of activity within the last few years in the dental field in the attempt to find such a resin and encouraging progress has been made. Most of the dental resins that have appeared upon the market have been of the phenol-formaldehyde type. It is difficult to say what degree of success they have obtained at the present time because they are constantly being modified, and the only test that is reliable is the test

of time. However, it may be said that as a class these resins have been decidedly lacking in strength, being exceedingly brittle which is a most serious disadvantage. This brittleness will be understood when it is remembered that fillers such as wood flour etc. which impart strength to moulded mechanical articles are not permissible in dental resins due to the opacity which these impart to the molding material. With many patients esthetics takes precedence even over utility. There has been also some difficulty in
(Continued on page 543)

Advertisers Index

Aladdinite Co.	492	Karolith Corp.	490
Albert and Son, L.	514	Kuhn & Jacob Machine & Tool Co.	538
American-British Chemical Supplies, Inc.	518	Kurz-Kasch Co.	540
American Pearl Essence Co.	544	Loomis Co., Evarts G.	504-5
Bakelite Corp.	548	Luco Products Corp.	543
Bates & Co., C. J.	544	Northern Industrial Chemical Co.	541
Becker-Moore	544	Norton Laboratories	539
The Burnet Co.	545	Peckham Mfg. Co.	544
The Burroughs Co.	494	Peters Co., C. B.	547
C. A. V. Jigs, Moulds & Tool Co., Ltd.	538	Recto Mfg. Co.	536
Cambridge Instrument Co.	515	Seranton Button Co.	533
Claremont Waste Mfg. Co.	545	Shaw Insulator Co.	534
Colton, Arthur, Co.	521	Siebert, R. R.	520
Conn. Molded Prod. Corp.	537	Siemon Co.	536
Dunning & Boschert	518	Smith and Smith	522
Du Pont Viscoloid Co.	493	Southwark Fdry. & Machine Co.	514
Economy Ticket & Label Co.	544	Standard Mirror Co.	522
Elmes Engineering Wks.	513	Standard Tool Co.	516
Erinoid Co. of America	497	State Chemical Co.	545
The Fiberloid Co.	491	Stokes Mach. Co., F. J.	512
Flexo Supply Co.	517	Joseph Stokes Rubber Co.	532
French Oil Mill Machy. Co.	520	Thropp, Wm. R. & Sons, Co.	513
General Electric Co.	535	Terkelsen Machine Co.	519
General Plastics, Inc.	489	Wiggins & Co., Inc., E. W.	521
Gray & Co., Wm. S.	544	Wood & Co., R. D.	516
Jungmann & Co.	544		

Say you saw it in PLASTICS

Exports of United States Pyroxylin Products, By Countries May, 1929

Countries	Sheets, rods, or tubes		Manufactures	
	Pounds	Dollars	Pounds	Dollars
France	45,146	7,015	.....	.....
Germany	25,685	6,964	97	498
Sweden	1,229	184	31	81
Switzerland .....	.....	.....	36	308
United Kingdom	191,089	58,517	12,126	11,151
Canada	175,529	125,375	38,542	60,146
B. Honduras .....	.....	.....	2	4
Guatemala	44	41	44	51
Honduras .....	.....	.....	71	90
Nicaragua .....	.....	.....	166	615
Panama .....	.....	.....	327	468
Salvador .....	.....	.....	59	323
Mexico	120	158	7,328	11,794
Newfoundland & Lab.	28	28	.....	.....
Jamaica	56	50	.....	.....
Other B. W. Indies .....	.....	.....	44	40
Cuba	104	215	660	1,551
Dominican Republic .....	.....	.....	73	111
Neth. W. Indies .....	.....	.....	50	420
Haiti, Rep. of .....	.....	.....	50	88
Argentina .....	.....	.....	137	1,309
Bolivia .....	.....	.....	16	35
Brazil	80	40	13	35
Chile	40	31	16	15
Colombia .....	.....	.....	157	442
Peru	31	50	66	101
Venezuela	105	123	343	1,637
China .....	.....	.....	332	397
Java & Madura .....	.....	.....	20	152
Iraq	103	137	.....	.....
Philippine Islands	270	353	268	522
Australia	2,998	2,173	1,557	2,392
New Zealand	863	654	20	235
Union of South Africa	80	64	32	47
Egypt .....	.....	.....	7	55
Total	443,600	202,172	62,690	95,113
Shipments from U. S. to:				
Hawaii	25	25	1,306	1,730
Porto Rico	1,045	1,334

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Engineering Service

Resins in Dentistry

(Continued from page 541)

the coloring; at times pink resins have changed to orange yellow or darkened to a purplish tinge. Certain other cases, while not breaking, have developed checks in service. The chemical effects of mouth conditions must not be overlooked for the denture is exposed to these for long periods, in some cases twenty four hours of the day. There are heat and moisture, digestive ferments, acids, bacterial action, food and liquids of all kinds, mucin deposits which may greatly increase the concentration of acids and other products of bacterial action by preventing circulation of the saliva. A resin which may remain unchanged for years when kept immersed in water may be found to soften and change its state when kept in the mouth for a few months. It is also to be noted that the mucous membranes are extremely sensitive; this in connection with the fact that the denture is kept in such intimate contact with these membranes for long periods, and sometimes continuously day and night, means that the resin must be entirely stable. Some resins have been tried which gave acute symptoms of sore throat, particularly to certain persons who may have been hypersensitive. This was probably due to some irritating constituent passing into solution in the saliva. With some of the resins in use the technique is rather laborious, extreme care being required to obtain correct results.

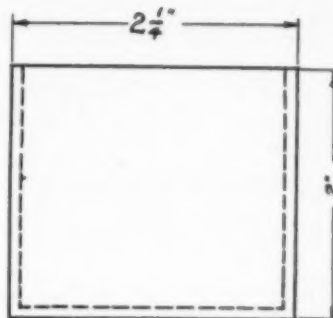
Ideal Vulcanite Substitute Not Yet Attained

All of the resins so far observed by the writer have been lacking in some of the points which have been mentioned above as important.

From this brief review, it will be evident that the problem of finding an improved substitute for vulcanite can not be considered as solved, that the specifications to be met are difficult but that there is a real need to be filled.

ALDUR

Synthetic Resins



SPECIFICATIONS OF A CUP

Height 2", Diameter 2 1/4", Thickness of Wall 3/32"

Pressure 1500/2000 lbs. per sq. in. on total area

Steam pressure 90 lbs.

Time in press 4 minutes

Die Carbon steel

Color { Snow White, Black, Ivory or Natural White
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Any translucent or non-translucent shade or
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Delivery from stock in whites, black, and all standard colors. Pastels and special shades can be matched to sample and shipped within 7 days of order.

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To Novelty and Container Manufacturers:

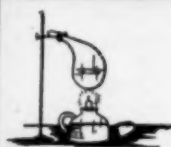
ALDUR offers a wonderful medium for the manufacture of containers of all sorts. Colors to match my lady's boudoir, colors to match your product. Bright color to increase your sales.

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